

SUBJECTIVE EVALUATION OF HEVC/H.265 BASED DYNAMIC ADAPTIVE STREAMING OVER HTTP (HEVC-DASH)

1

Iheanyi Caleb Ironi*, Qi Wang & Christos Grecos, UWS, UK.

RATIONALE / MOTIVATION

2

VIDEO STREAMING CHALLENGES

- Instability of the network due to limited bandwidth and dynamically changing WAN conditions.
- Support for HD, UHD and other systems with high bandwidth requirements.
- Video traffic dominates global consumer traffic.
- Adapting the video streaming session to user's bandwidth condition.
- Integration of the latest video compression standard (H.265/HEVC) with DASH.

DYNAMIC ADAPTIVE STREAMING OVER HTTP (DASH)

4

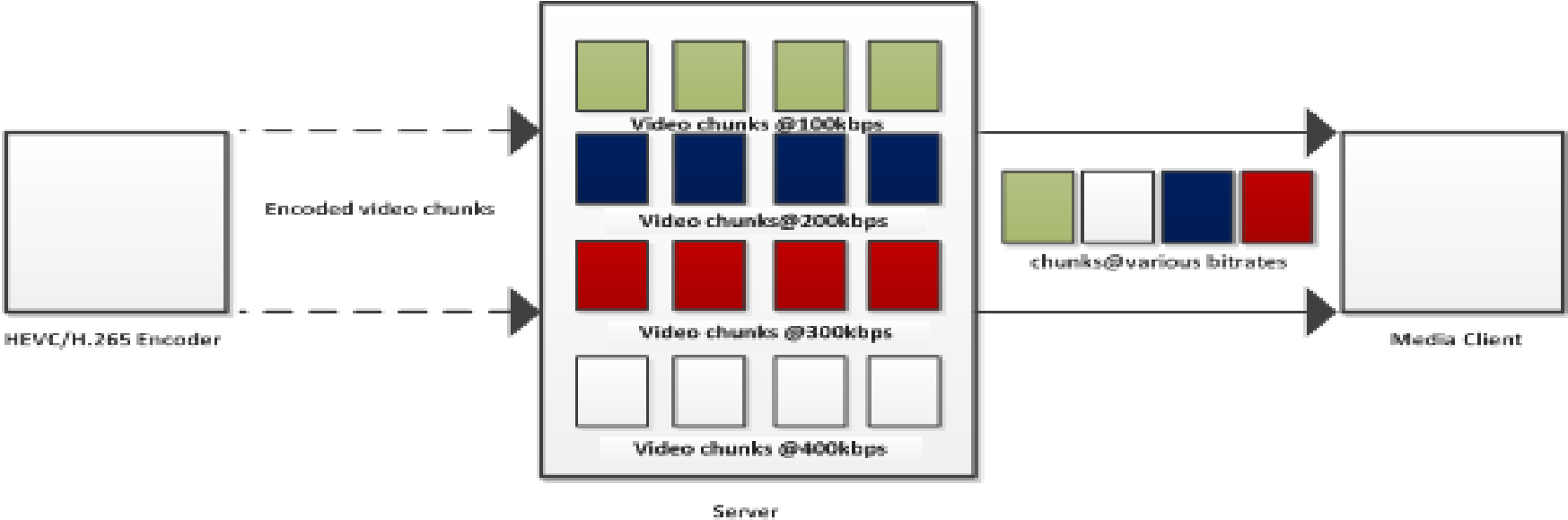
MPEG DYNAMIC ADAPTIVE STREAMING OVER HTTP

- ❑ ISO/IEC adaptive streaming standard for dynamic adaptive delivery of high quality multimedia contents.
- ❑ Published as ISO/IEC 23009-1:2012.
- ❑ Transverses firewalls unlike RTP packets.
- ❑ Supports Content Distribution Networks (CDN) which provide localized edges.
- ❑ Makes use of existing internet infrastructures.
- ❑ Runs on popular HTTP protocol and does not need specialized servers..

MPEG DYNAMIC ADAPTIVE STREAMING OVER HTTP

- Employs a server/client approach.
- Different bandwidth representations of same video.
- Segmentation of the different bandwidth representations into chunks.
- Stored on the webserver.
- HTTP request from DASH client to HTTP server using HTTP get partial get commands.
- Receipt of xml file describing contents.
- Streaming video adapted to clients network condition.
- Streaming session controlled by the client.

MPEG DYNAMIC ADAPTIVE STREAMING OVER HTTP



Adaptive streaming of video chunks

(HIGH EFFICIENCY VIDEO CODING) HEVC/H.265 STANDARD

- Latest video compression standard.
- Substantial reduction in bandwidth requirement (~50%) at same picture quality when compared with its predecessor H.264/AVC.
- Increased use of parallel processing.
- Support for 8k UHD videos.
- Larger block structure up to 64x64 pixels which helps in achieving better efficiency.

INTEGRATION OF HEVC/H.265 WITH DASH

HEVC/265 BASED DYNAMIC ADAPTIVE STREAMING OVER HTTP

❑ Objective metrics (PSNR, SSIM, VQM)

- ❑ Compares impaired video to source video using mathematical algorithms.
- ❑ Does not reflect human perception of video.

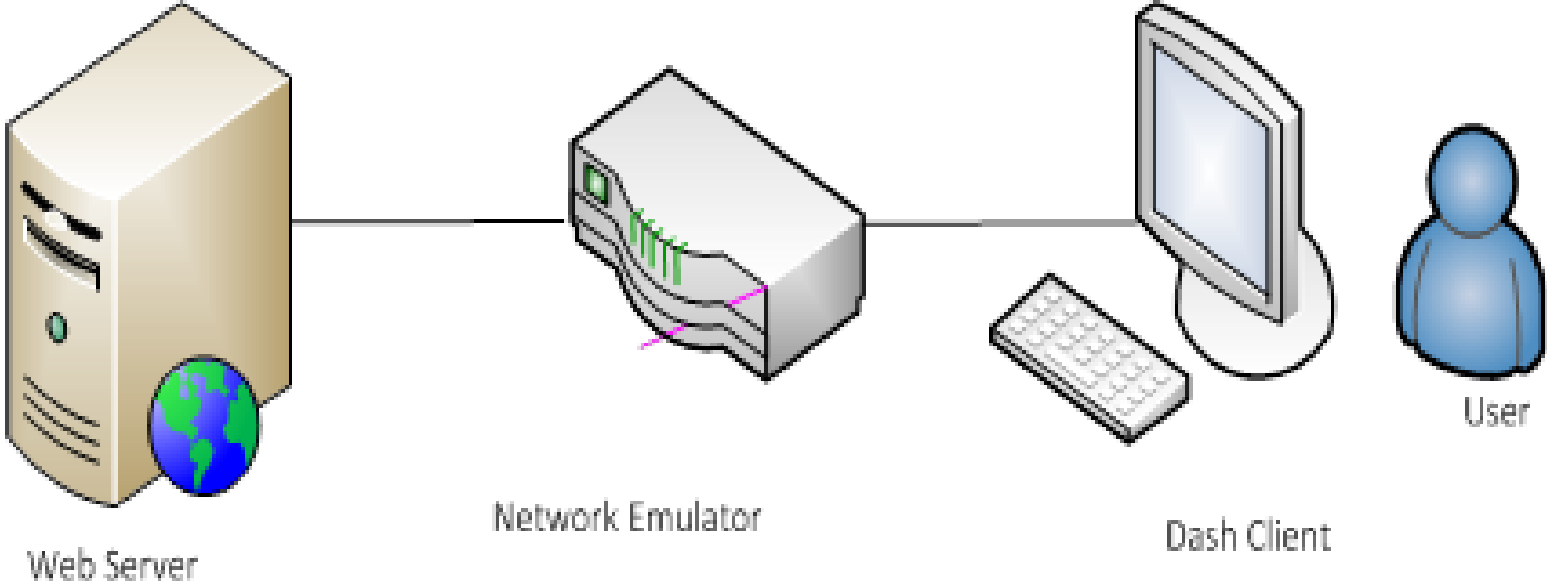
❑ Subjective metric.

- ❑ Consumers perception of quality.
- ❑ Human subjects.
- ❑ Rate video based on perception and Quality.
- ❑ Evaluation of the Quality of Experience (QoE).

SUBJECTIVE EVALUATION

- No established standard test procedure for subjective evaluation of DASH .
- Existing methods not sufficient.
- Cyclical effects of known issues on DASH.
- Longer video sequence instead of 10s clips.
- Controlled environment.
- Real-time subjective evaluation.

SUBJECTIVE EVALUATION

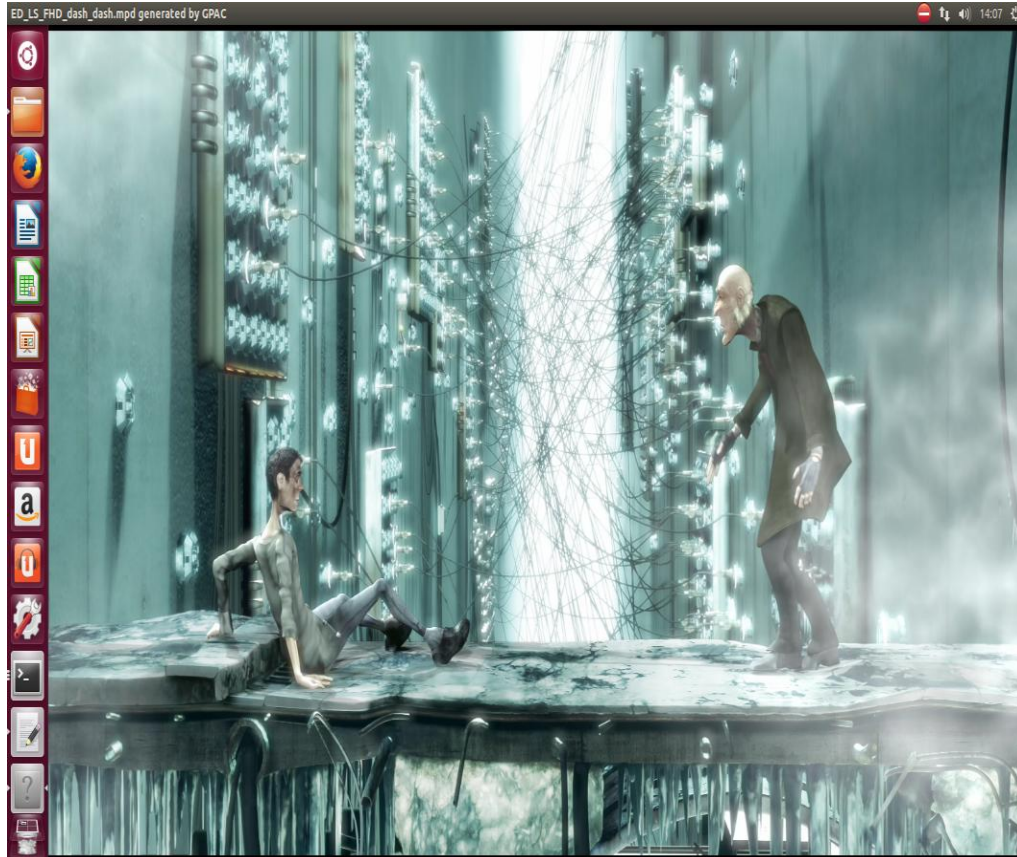


Test bed

SUBJECTIVE EVALUATION METHODOLOGY

- Encoding and segmentation of video streams into chunks.
- Emulating variable packet loss ratio (1%, 3%, 5%).
- Emulating Variable delay (50ms, 100ms, 150ms).
- Investigating the impact of 2s and 10s video segment sizes.
- Longer video sequence.
- 10 volunteers.
- Controlled environment with 22" TV monitor.
- Use of Absolute Category Rating Scale (ACR)....ITU-T Recommendation P.910.
- Random order.
- Mean Opinion Score (MOS).

VIDEO SEQUENCES



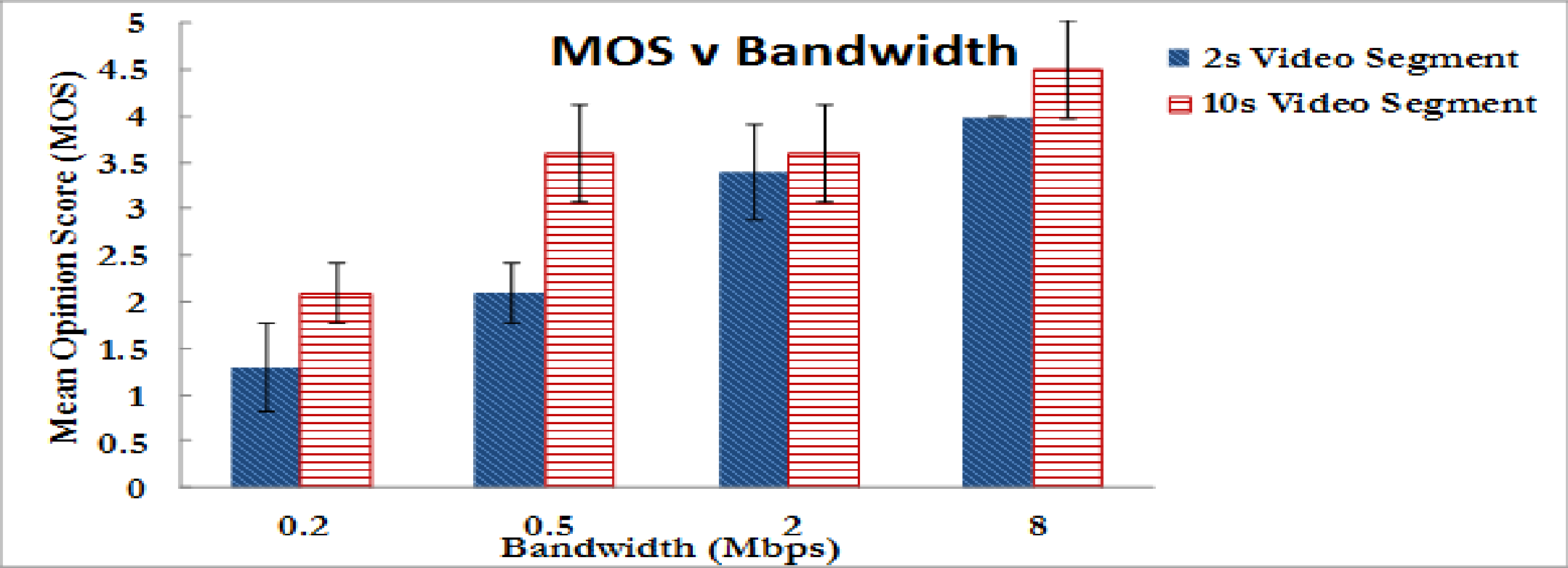
ACR SCALE

5	Excellent
4	Good
3	Fair
2	Poor
1	Bad

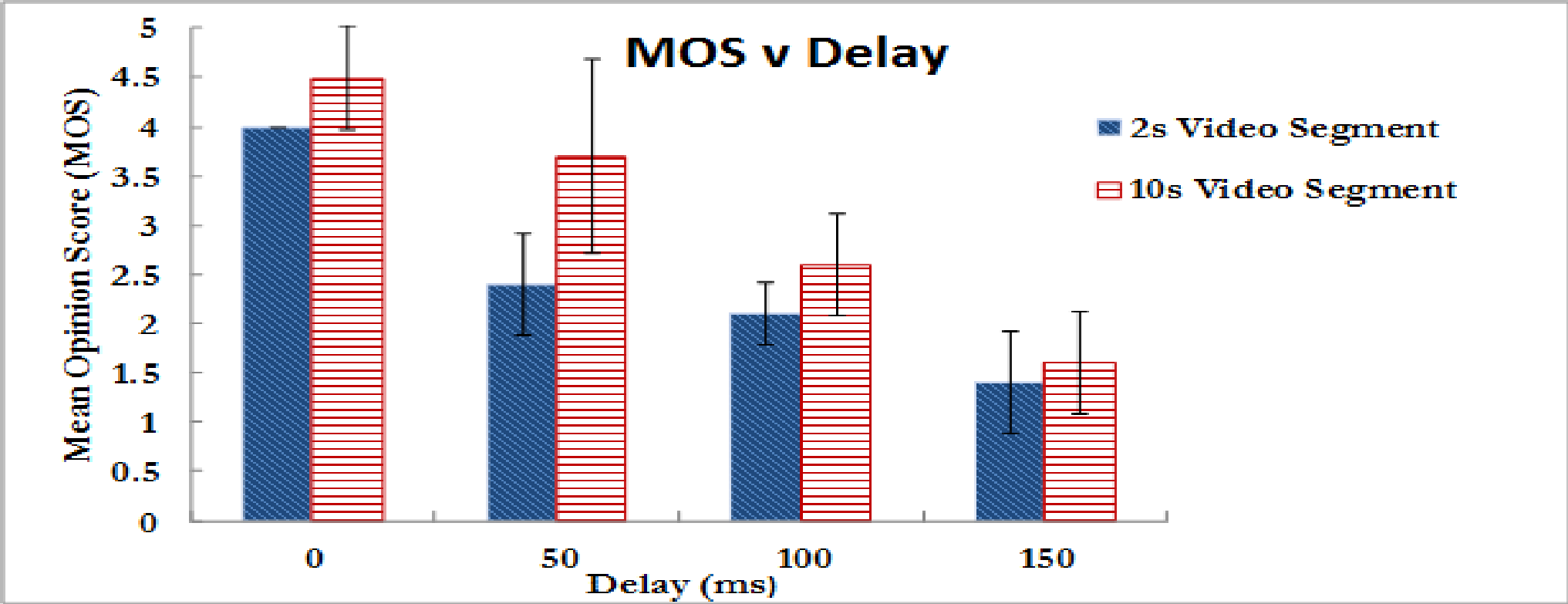
ACR Scale

EXPERIMENTAL RESULTS

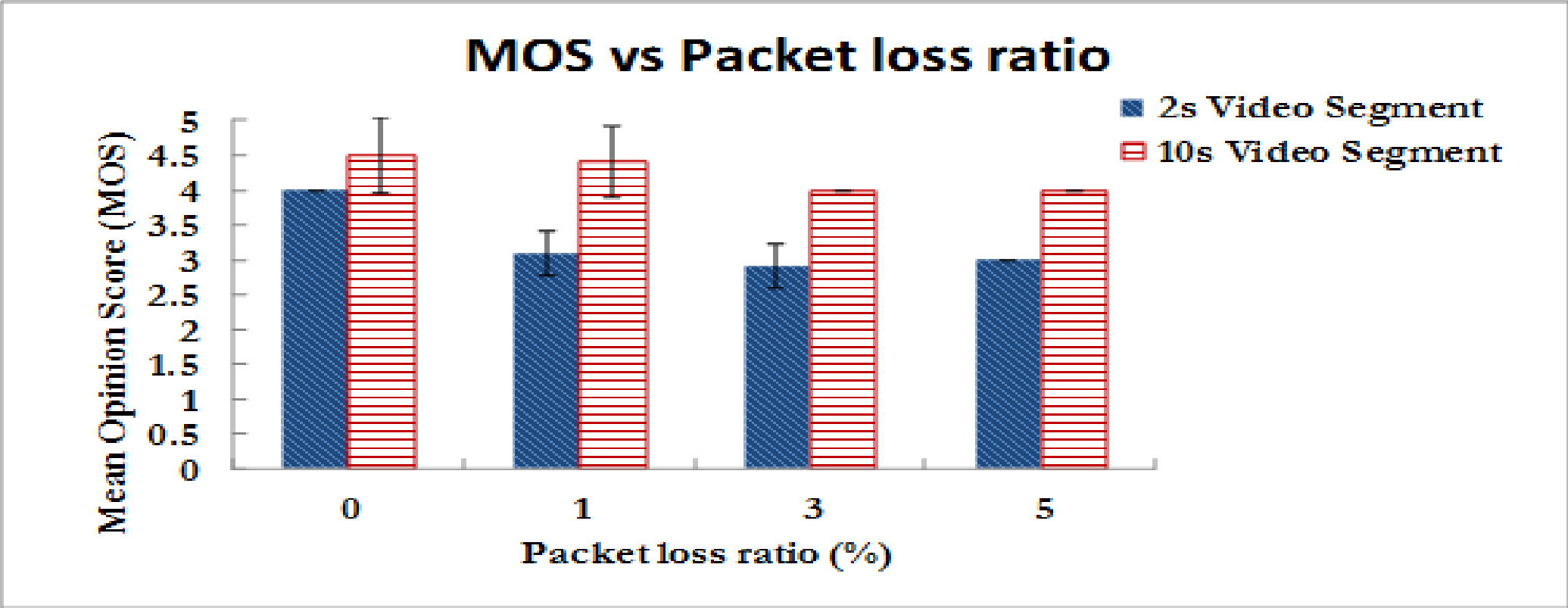
SUBJECTIVE EVALUATION RESULTS



SUBJECTIVE EVALUATION RESULTS



SUBJECTIVE EVALUATION RESULTS



SUMMARY

SUMMARY

- Practical test bed for subjective evaluation.
- Subjective evaluation of the impact WAN characteristics on DASH.
- Compared performance between small and large segment sizes respectively.
- Longer segment sizes provide better compression
- Shorter segment sizes switch easily in case of sudden drop in network quality.
- From the results, users had better QoE with the 10s segment videos.
- MOS was reduced with increasing value of impairments.
-Initial delay.
-Stalling during playback.
-Flicker.
- Trade-off?

WAYS OF STREAMING VIDEOS

- Progressive downloading

- RTP-based streaming

- Adaptive HTTP-based streaming.
 - ✓ HTTP is firewall friendly.
 - ✓ Support CDN which provide localized edges.
 - ✓ Client manages the streaming session where adaptation of bandwidth is done at the client.

WHY DASH?

- ❑ Different industry proprietary solutions for adaptive streaming.
 - ❑ Microsoft's Smooth streaming.
 - ❑ Adobe's HTTP Dynamic streaming (HDS).
 - ❑ Apple's HTTP live streaming (HLS)

- ❑ Different manifest and segment formats.
- ❑ Device must support a corresponding proprietary client protocol in order to receive a content from each server.
- ❑ Interoperability between different servers and clients of various vendors.

- ❑Hence MPEG-DASH!!!!!!