dc3189

ATHENA
Christian Doppler (CD) Laboratory

ALPEN-ADRIA UNIVERSITÄT
KLAGENFURT | WIEN GRAZ
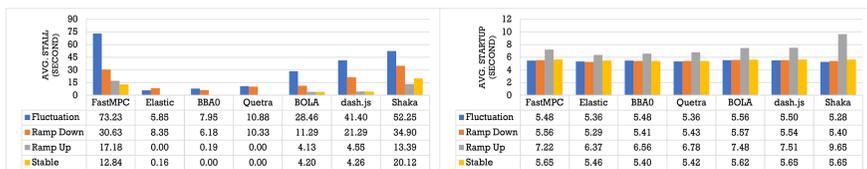
ACM multimedia
Chengdu, China OCT 20-24 2021

End-to-end Quality of Experience Evaluation for HTTP Adaptive Streaming
Babak Taraghi, Christian Doppler Laboratory ATHENA, Alpen-Adria-Universität Klagenfurt

INTRODUCTION

➢ HTTP Adaptive Streaming (HAS) is today's prevailing technique to deliver the highest possible audio and video content quality to the users. An end-to-end evaluation of QoE in HAS covers the precise measurement of the metrics that affect the perceived quality, e.g., startup delay, stall events, and delivered media quality.

➢ HAS can be divided into Content Provisioning, Content Delivery, Content Consumption, and End-to-end Aspects. The End-to-end Aspects cover the other three categories from a higher point of view, which means less granular detail of other categories will be included, with integration and complete system functionality, being the main consideration.

➢ In this study, we will investigate the significant metrics, best practices and evaluations methods, and available techniques with an aim to:
  • Design and develop practical and scalable measurement tools and prototypes.
  • Provide a better understanding of current technologies and techniques (e.g., Adaptive Bitrate algorithms).
  • Conduct in-depth research on the significant metrics in a way that improvements of QoE with scalability in mind would be feasible.
  • Provide a comprehensive QoE model which outperforms state-of-the-art models.

	FastMPC	Elastic	BBA0	Quetra	BOLA	dash.js	Shaka
Fluctuation	73.23	5.85	7.95	10.88	28.46	41.40	52.25
Ramp Down	30.63	8.35	6.18	10.33	11.29	21.29	34.90
Ramp Up	17.18	0.00	0.19	0.00	4.13	4.55	13.39
Stable	12.84	0.16	0.00	0.00	4.24	4.26	20.12

	FastMPC	Elastic	BBA0	Quetra	BOLA	dash.js	Shaka
Fluctuation	5.48	5.36	5.48	5.36	5.36	5.50	5.28
Ramp Down	5.56	5.29	5.41	5.43	5.57	5.54	5.40
Ramp Up	7.22	6.37	6.56	6.78	7.48	7.81	9.65
Stable	5.56	5.46	5.40	5.42	5.65	5.65	5.65

Measurments of Significant Metrics for a Set of Well-known ABR Algorithms. B. Taraghi et al. Understanding Quality of Experience of Heuristic-Based HTTP Adaptive Bitrate Algorithms.

RESEARCH QUESTIONS

➢ How to define, implement, and deploy end-to-end QoE for HAS deployments at scale?
We will investigate the possibilities of how to assess a video streaming session to understand its characteristics and implement improvements on the end-to-end aspects toward a better perceived QoE. Scalability plays an important role in perceived QoE in video streaming, which means the number of concurrent viewers or clients could significantly impact each session's QoE.

➢ How to develop a QoE-driven, context-aware, and collaborative HAS environment?
As a hypothesis, we believe that the results of the QoE assessment of video streaming sessions can give useful insights into the perceived QoE by actual end-users for each category of video content, e.g., animation, action, game events. Keeping this hypothesis in mind, we will investigate how to improve the perceived QoE for each content type.

➢ How to utilize various information from end-to-end aspects to enhance HAS deployments?
For instance, the HAS's content delivery aspect refers to the network links between the network nodes e.g., the connection between the client machine and the content server. The properties of such links can differ in different conditions and strongly relate to the user's level of annoyance or delightfulness.
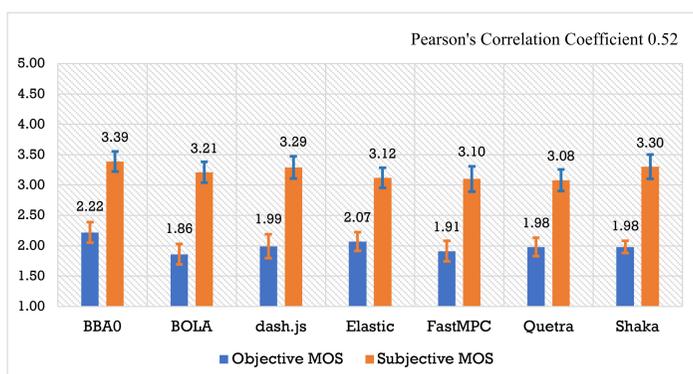
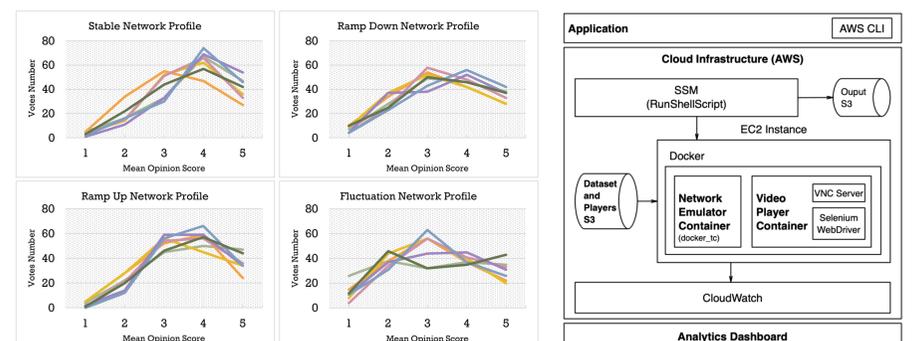Average QoE Score of ABRs in Fluctuation Network Profile.

End-to-end Aspects of the HTTP Adaptive Streaming
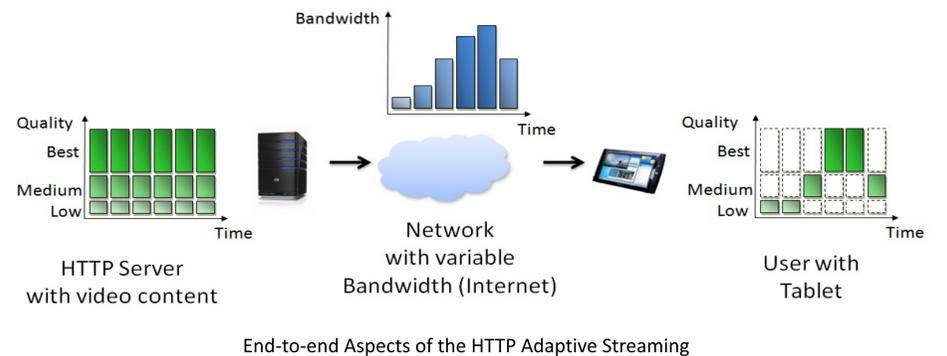
RESEARCH METHODOLOGY

➢ An Iterative and Incremental Development (IID) approach to (i) design, (ii) develop, and (iii) evaluate proposed solutions, by which means the progress toward the defined goals would be added incrementally in each round of iterations over the mentioned phases and also evaluated iteratively.

➢ An experimental approach, where all novel tools and methods will be evaluated and validated using controlled experiments through objective or subjective evaluations.

Left: Distribution of Subjective MOS for ABRs. Right: CAdViSE System Architecture.
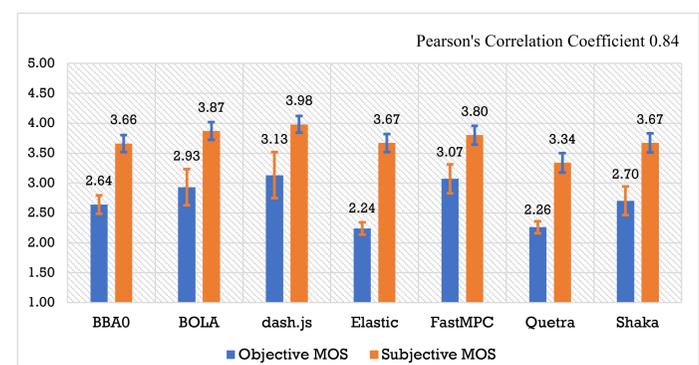
Average QoE Score of ABRs in Stable Network Profile.

REFRENCES

➢ Babak Taraghi, Abdelhak Bentaleb, Christian Timmerer, Roger Zimmermann, and Hermann Hellwagner. 2021. Understanding Quality of Experience of Heuristic-Based HTTP Adaptive Bitrate Algorithms. In Proceedings of the 31st ACM Workshop on Network and Operating Systems Support for Digital Audio and Video (Istanbul, Turkey) (NOSSDAV '21). Association for Computing Machinery, 82–89. https://doi.org/10.1145/3458306.3458875

➢ Babak Taraghi, Anatoliy Zabrovskiy, Christian Timmerer, and Hermann Hellwagner. 2020. CAdViSE: Cloud-Based Adaptive Video Streaming Evaluation Framework for the Automated Testing of Media Players. In Proceedings of the 11th ACM Multimedia Systems Conference (Istanbul, Turkey) (MMSys '21). Association for Computing Machinery, 349–352. https://doi.org/10.1145/3339825.3393581