POLITECNICO DI TORINO

Dipartimento di Automatica e Informatica

PhD in Computer and Control Engineering

XXX cycle

Supervisor

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Multimedia Communication Optimization for Web Environments

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1. Introduction

- *Digital Video Streaming* is becoming **increasingly popular**.
- **Video on Demand** and **Live Streaming** platforms are trendy.
- Guaranteeing a decent **Quality of Experience** remains challenging.
- **Rate Adaptive Technologies** aim at closing this gap but still work needs to be done.
- **eLearning** platforms used as a testbed for multimedia testing.

2. Objectives

- The word *quality* is **not self explicating**. It is necessary to understand the main metrics which may help understanding the overall quality of experience like e.g. quality of transmitted video, video playback stalling due to bandwidth fluctuations, delays and buffer sizing strategy, end-to-end latency, and last but not least the impact on battery life.
- Understand how novel technologies are used in todays platforms and the optimization techniques set into place.
- Extract quality information also in the most challenging situations, like e.g. when the original source is not available at the receiver.
- Study an **optimization model** and test it against a real world case to understand its possible implications.

3. Methodology

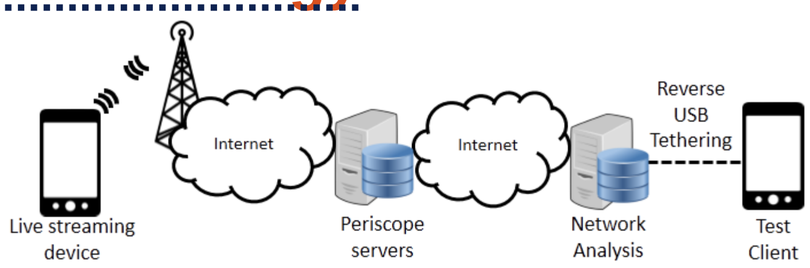

Figure 1. Scheme of the Periscope Analysis

- **Extract** information from the sessions grabbed (e.g. reconstruct TCP streams)
- Understand the **protocols** and the optimization techniques used.
- Analyze the probes by running **quality assessment algorithms**.
- Absence of original reference imposes the use of **No-Reference** quality assessment algorithms.

NO-REFERENCE QUALITY ASSESSMENT

- ❖ Extract the **quantized coefficients** from the received video frames.
- ❖ Perform **statistical analysis** to determine parameters of PDF.
- ❖ Calculate **MSE** and **PSNR** using those coefficients.

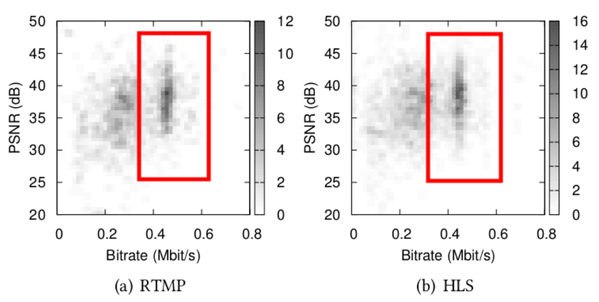

Figure 2. PSNR over Bitrate of both RTMP and HLS sessions.

FARE, the Free Architecture for Remote Education

- FARE, a FOSS online **eLearning platform.**
- Draws from a set of **general purpose distributed repositories** through the *CMIS APIs.*
- **Search** for *Learning Objects*, **select** the desired ones, **pick** just some parts and **remix** them creating a final composition.
- **Integrates** live streaming technology and other interactive tools for learning.

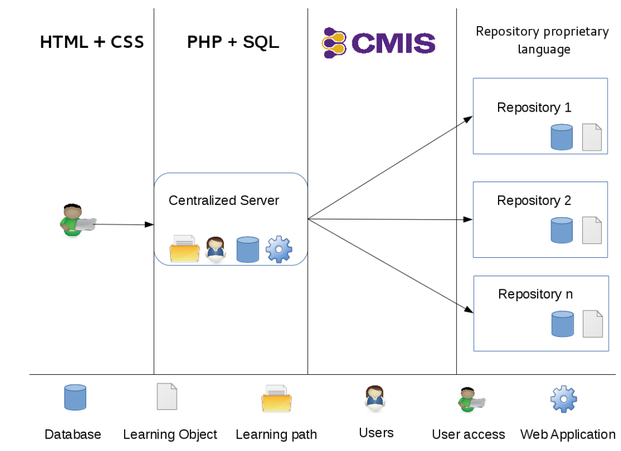

Figure 3. Scheme of the FARE architecture

4. Proposal

- Proposed a **new quality optimization framework** for *DASH* streaming over wireless network.
- Tuned tradeoff between the **quality** of received content and the **probability of playback freeze** due to an empty buffer.
- Effectiveness **tested** both on software and real 3G conditions.

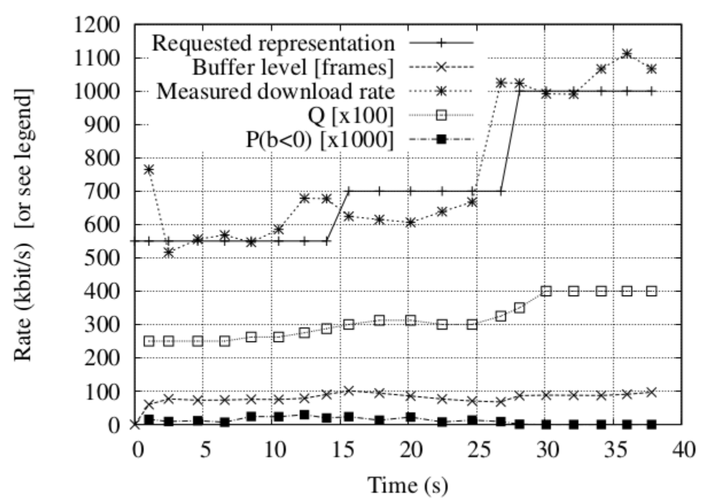

Figure 4. Behavior of the proposed technique as a function of time.

5. Conclusions

- Studied the state of the art and **underlined the shortcomings.**
- Focused on **quality assessment**, in particular *No-Ref* approach.
- **Proposed a new framework** for handling *DASH* streaming.
- Tested against **real world scenario** (*eLearning* platform).

6. References

1. Favario L., Masala E., *A New Architecture for Cross-Repository Creation and Sharing of Educational Resources*, iJET 12(2): 185-209 (2017).
2. Favario L., Siekkinen, M., Masala, E., *Mobile Live Streaming: Insights from the Periscope Service*, IEEE MMSP, Montreal, Canada, September 2016.
3. Favario L., Masala E., *A New Quality Optimization Framework for DASH Streaming over Wireless Channels*, IEEE ICME, Torino, Italy, Jun-Jul 2015.