Demo: On the Monitoring of YouTube QoE in Cellular Networks from End-devices

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1. INTRODUCTION

In this demonstration, we present YoMoApp (YouTube Performance Monitoring Application), a passive measurement application for client side monitoring of YouTube video streaming on mobile Android devices. The application uses the YouTube mobile website and the HTML5 API to exactly replicate the well-known YouTube service, which employs HTTP adaptive streaming (HAS) technology based on resolution adaptation. It monitors and stores multiple Key Performance Indicators (KPIs) of the video streaming via the YouTube API (i.e., player state/events, buffer, and video quality level), which allow to analyze the QoE of adaptive video streaming sessions.

2. THE YOMOAPP TOOL

The goal is to provide a methodology to monitor application layer KPIs of YouTube that have a high correlation with the actual QoE of mobile app users. According to [1], the main influence parameters of the YouTube QoE are *stallings* and *video quality*. To obtain these parameters, we monitor the buffer and the resolution of the YouTube videos.

YoMoApp (YouTube Performance Monitoring Application) [2] fully replicates the original YouTube app in functionality and design. An Android WebView browser element is embedded to display the YouTube mobile web site on which HTML5 video playback, including adaptive streaming, is possible. Additional functions are added, which ultimately perform the monitoring of the application parameters in the newly created app. The monitoring is done at runtime via JavaScript, which queries the HTML5 ⟨*video*⟩ object.

Fig. 1 shows the data of an exemplary run in their processed form. Postprocessing of the data is recommended because JavaScript can sometimes introduce inconsistencies and obvious errors, e.g., missed player events, non-equidistant data queries, missing/incorrect values. However, after removing unusable runs and the recovery of missing events (e.g., stalling events can be estimated from buffer filling level), YoMoApp proved to perform accurate measurements on a sufficiently small time scale (∼1 s).

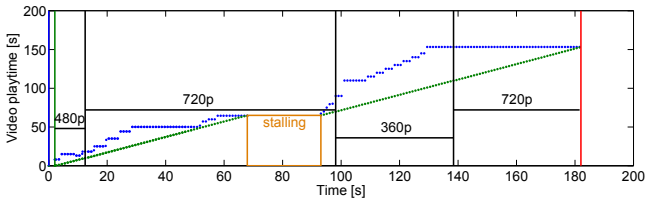

Figure 1: Monitored parameters of an exemplary video streaming: current video playtime (green), buffered video playtime (blue), played out video quality/resolution (horizontal black lines). Events (vertical lines): page load (blue), playback start (green), quality switch (black), stalling (orange box), playback end (red).

3. DEMONSTRATION

The demonstration shows the capabilities of YoMoApp. On the main screen, the users learn about the features of the app. They can start using YouTube, they can access the playback statistics of already watched videos (statistics/chart view), and they can manually upload the measurement data. If the users start YouTube, they experiences the same look and feel as the normal YouTube app, even YouTube settings can be used and changed. After searching for and/or browsing to a video, the playback can be started and typical features like fullscreen or smartphone rotation are enabled. After the playback is completed, a subjective rating of the perceived quality can be given. In the statistics view, all measured parameters are summarized. By clicking on the values, more details and timestamps are presented. Additionally, for each video a chart view similar to Fig. 1 is available. When closing YoMoApp, the measured data are uploaded to an external database on the Internet.

A screencast of the demonstration is available at:
`https://www.youtube.com/watch?v=yhG0jTGkk08`.

4. REFERENCES

[1] M. Seufert, et al., "A Survey on Quality of Experience of HTTP Adaptive Streaming," *IEEE Communications Surveys & Tutorials*, vol. 17, 2015.
[2] F. Wamser, et al., "YoMoApp: a Tool for Analyzing QoE of YouTube HTTP Adaptive Streaming in Mobile Networks," *EuCNC*, Paris, France, 2015.

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