Video adaptation in limited/zero network coverage

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ABSTRACT

This paper shows how adaptive streaming and on-device caching can be used to provide an always available video service. A DASH client has been extended to deal with periods of zero network connectivity, and seamlessly works in conjunction with CCN to provide local storage that is intelligently updated to provide an improved quality of experience.

Figure 1. Demonstration Setup

INTRODUCTION

Due to the increasing availability of mobile high speed Internet connections like WLAN/3G/4G and the huge smartphone boom in the recent years, mobile video streaming is becoming more and more important, predicted to be 60% of the total mobile traffic by 2018 [1]. Conventional RTP based streaming as well as basic progressive HTTP download/streaming are not suitable for these mobile environments with high bandwidth fluctuations or network outages. The video stream needs to adapt to the varying bandwidth changes in order to deliver a continuous video stream without stalls at the best possible quality to the user, which is achieved by the new MPEG-DASH standard [3].

CCN [2] and MPEG-DASH [3] have several elements in common such as the client-initiated pull approach, the content being dealt with in pieces as well as the support of efficient replication and distribution of content pieces within the network [4]. In combination with intelligent pre-caching, as shown in our research [5], this can be used to improve the availability of multimedia content, and thus also the Quality of Experience (QoE) of the user. Additionally in mobile network, the combination of DASH and CCN comes together with a range of advantages to today's IP-based Internet infrastructure [6][1].

DEMONSTRATION SETUP

The presented demonstration setup, depicted in Figure 1, consists of a mobile device, i.e. a tablet, which is connected via a network emulation node to a remote CCN node, which is offering multimedia content. The network emulation node simulates different network conditions, i.e. bandwidth changes in a cellular network b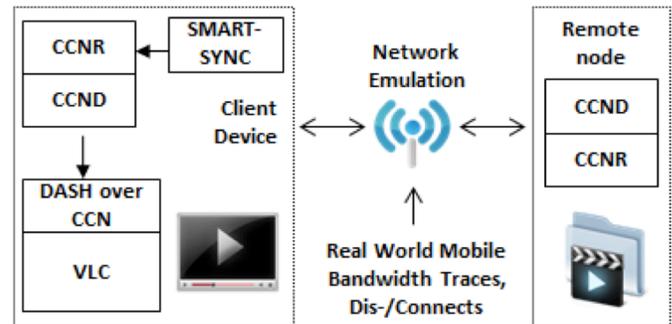ased on real-world bandwidth traces as well as disconnects and connects. At the client, our Smart-Sync service performs an intelligent pre-caching of a low-quality version. Due to this, there is always at least a low quality version of the content available in the local ccnr cache, which can be played by our DASH over CCN-enabled VLC player, even if there are disconnects from the network or only limited-bandwidth conditions present. However, in cases of sufficient bandwidth resources, the client is able to request higher quality representations from the remote node, and thus increase the QoE of the viewer.

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