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A Survey on Quality Adaptive Streaming

Sai Ram. G [1], N.Sri Hari Rao [2]

[1] M.Tech student, Department of CSE, CMR institute of Technology, Dist: R.R, Hyderabad, AP, India
Email-id: g.sairam009@gmail.com

[2] Associate Professor, Department of CSE, CMR institute of Technology, Dist: R.R, Hyderabad, AP, India
MIAENG, MCSI, MISTE
Email-id: raon2006@gmail.com

Abstract

HTTP video streaming, Flash video is widely positioned to deliver stored media. Due to TCP's consistent service, the picture and sound quality would not be degraded by network impairments, such as high delay and packet loss. In particular, Adobe's Flash video (FLV) plays an important role in storing and streaming videos via HTTP over TCP. This paper extends some of the methods of HTTP video streaming, techniques as a literature survey.

Keywords- *Subjective testing. Video Quality, Quality of service.*

1. Introduction

Internet access is becoming a commodity on mobile devices. With the recent popularity of smart phones, smart books, connected netbooks and laptops the Mobile Internet use is dramatically expanding. Traditional streaming generally uses a stateful protocol, e.g., the Real-Time Streaming Protocol (RTSP): Once a client connects to the streaming server the server keeps track of the client's state until the client disconnects again. Typically, frequent communication between the client and the server happens. Once a session between the client and the server has been established, the server sends the media as a continuous stream of packets over either UDP or TCP transport.

In contrast, HTTP is stateless. If an HTTP client requests some data, the server responds by sending the data and the transaction is terminated. Each HTTP request is handled as a completely standalone one-time transaction.

HTTP-based progressive download does have significant market adoption. Therefore, HTTP-based streaming should be as closely aligned to HTTP-based progressive download as possible, but take into account the above-mentioned deficiencies.

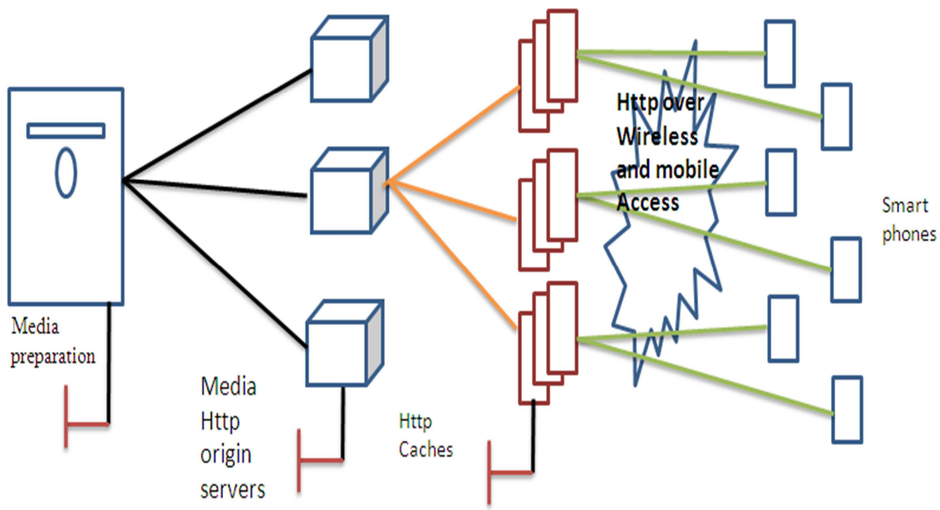

Figure1. Media Distribution Architecture.

Above Figure shows possible media distribution architecture for HTTP-based streaming. The media preparation process typically generates segments that contain different encoded versions of one or several of the media components of the media content. The segments are then hosted on one or several media origin servers typically, along with the media presentation description (MPD). The media origin server is preferably an HTTP server such that any communication with the server is HTTP-based (indicated by a bold line in the picture). Based on this MPD metadata information that describes the relation of the segments and how they form a media presentation, clients request the segments using HTTP GET or partial GET methods. The client fully controls the streaming session, i.e., it manages the on-time request and smooth playout of the sequence of segments, potentially adjusting bitrates or other attributes, for example to react to changes of the device state or the user preferences. The reasons that lead to the choice of HTTP as the delivery protocol for streaming services are summarized below:

(i) HTTP streaming is spreading widely as a form of delivery of Internet video.

(ii) HTTP-based delivery enables easy and effortless streaming services by avoiding NAT and firewall traversal issues.

(iii) HTTP-based delivery provides reliability and deployment simplicity due as HTTP and the underlying TCP/IP protocol are widely implemented and deployed.

(iv) HTTP-based delivery provides the ability to use standard HTTP servers and standard HTTP caches (or cheap servers in general) to deliver the content, so that it can be delivered from a CDN or any other standard server farm.

(v) HTTP-based delivery provides the ability to move control of "streaming session" entirely to the client. The client basically only opens one or several or many TCP connections to one or several standard HTTP servers or caches.

(vi) HTTP-based delivery provides the ability to the client to automatically choose initial content rate to match initial available bandwidth without requiring the negotiation with the streaming server.

2. Literature survey

Margaret H Pinson et al. [1] presents a description of National Telecommunications and Information Administration (NTIA) is a General Model for estimating video quality and its associated calibration techniques like estimation and correction of spatial alignment, temporal alignment, and gain/offset errors were independently evaluated by the Video Quality Experts Group (VQEG) in their Phase II Full Reference Television (FR-TV) test. The General Model was designed to be a general purpose video quality model (VQM) for video systems that span a very wide range of quality and bit rates. Extensive subjective and objective tests were conducted to verify the performance of the General Model before it was submitted to the VQEG Phase II test. While the independent VQEG Phase II FR-TV tests only evaluated the performance of the General Model on MPEG-2 and H.263 video systems, the General Model was developed using a wide variety of video systems and thus should work well for many other types of coding and transmission systems.

Jirka Klaue et al. [2] discusses a complete framework and tool-set for evaluation of the quality of video transmitted over a real or simulated communication network and it also maintenances a subjective video quality evaluation of the received video based on the frame-by-frame PSNR calculation and presented a framework and a toolkit for a unified assessment of the quality of video transmission. It has a modular structure, making it possible to exchange at user’s discretion both the underlying transmission system as well as the codecs, so it is applicable to any kind of coding scheme, and might be used in real experimental set-ups. The tools are implemented in pure ISO-C for maximum portability. All interactions with the network are done via two trace files. So it is very easy to integrate EvalVid tool in any environments. This tool-set currently supports MPEG-4 video streaming applications but it can be easily extended to address other video codecs or even other applications like audio streaming.

Ricky K. P. Mok et al. [3] outlined the association among three levels of quality of service (QoS) of HTTP video streaming: (a) network QoS, (b) application QoS and (c) user QoS. The process of this approach follows two steps, first characterize the correlation between the applications and network QoS using analytical models and empirical evaluation. Second it performs subjective experiments to evaluate the relationship between application QoS and QoE. In general it uses a set of application performance metrics (APM) Initial buffering time, mean duration of a rebuffering event and rebuffering frequency. The QoE could be improved by either network QoS or application QoS management.

Kalpana Seshadrinathan et al. [4] presented the results of a recent large-scale subjective study of video quality on a collection of videos distorted by a variety of application-relevant processes. Methods to assess the visual quality of digital videos as perceived by human observers are becoming increasingly important, due to the large number of applications that target humans as the end users of video. This study included ten uncompressed reference videos of natural scenes and one hundred and fifty distorted videos using four different distortion types commonly encountered in applications. Each video was assessed by thirty eight human subjects in an exceedingly single input study with hidden reference removal, wherever the subjects scored the video quality on an external quality scale.

Samir Mohamed et al. [5] discussed in twofold: First, the Random Neural Network model, and its learning algorithm, which both offer many advantages. Second, it analyzes the behavior of video quality for wide range variations of a set of selected parameters. There are several parameters that affect the quality of video transmission over packet networks as follows: Coding and compression parameters and network parameters. The analysis of the video quality can be done using either objective tests or subjective ones. Objective tests are always explicit functions of measurable parameters related to the encoder or to the network. Subjective tests are based on evaluations made by human subjects under well-defined and controlled conditions. The main properties of our technique are the following: (i) the evaluation can be done in real time (ii) the value assigned to the quality of the flow am close to the value that could be obtained from a subjective test.

Sandeep Kanumuri et al. [6] presented two modeling approaches: Classification and Regression Trees (CART) to classify each packet loss as visible or invisible. And generalized linear model (GLM) used to predict the probability that a packet loss will be visible to an average viewer. The input to these models consists of parameters which will be easily extracted from the video near the location of the loss.

3. Conclusion

This paper provides the outline regarding the Http Adaptive streaming and a general purpose video quality model (VQM) and its associated standardization routines as a literature survey.

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