

Position Paper: “Network-Assistance and Server Management in Adaptive Streaming on the Internet”

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Xin Wang

Media Technology Lab, Corporate Research, Huawei Technologies, LTD.

The current HTTP based web video streaming technologies, including the MPEG Dynamic Adaptive Streaming over HTTP (DASH) standard that has been adopted by YouTube, Netflix, Hulu, etc., have been designed to enable efficient delivery of multimedia services, mainly based on two essential premises: leverage on the existing Internet infrastructure, such as HTTP based content distribution networks, and client-driven nature of streaming content based on client’s environment and capability characteristics (e.g., client decoding and rendering capabilities, and available bandwidth of the network connection).

However, their dynamic adaptation to variable network and environment conditions is also managed and controlled by the client, whereas the server merely plays a hosting role for available streaming content segments for the client to select and adapt according to client’s own adaptation and control strategy. In this kind of client-managed adaptive streaming, not only the server plays a passive role, but also the underlying delivery network provides no active assistance, other than being a “pipe”, toward ensuring a certain level of QoE of streaming for end users.

There are a number of technical and business issues with this pure client-managed dynamic adaptive streaming that does not incorporate server management and has no network assistance. Some of them are:

- No guaranteed QoE, especially in a mobile network environment involving many streaming clients
- No coherent QoE across clients from different vendors, as they may implement different adaptation strategies, resulting in different user experiences of even same content
- No global optimization in allocating network and server resources across a community of different clients, as “aggressive” clients may make other “conservative” ones “starve”, especially when those resources (e.g., wireless bandwidth) are limited and shared among the clients
- No differentiation or provisioning on different clients and users to facilitate viable business models for streaming services
- No or lack of incentives for network operators to participate this adaptive streaming ecosystem, as they have no opportunity to develop a profitable business

It is our belief that, in a viable web video streaming ecosystem that can gain market attraction, participation by network operators and management from the “cloud” are crucial, and hence capabilities for providing network assistance by network operators and server management by service providers as well as opportunities for streaming service providers to collaborate with networks operators to deliver high-quality streaming services are very important. For instance, the recent development of the Redbox Instant by Verizon video-streaming service on Roku set-top devices shows a market attempt in this direction.

At this workshop, we’d like to

- provide our thoughts on how to provide supports in adaptive streaming for network assistance and server management, as well as hybrid management that involve clients, servers and networks;
- demonstrate their benefits by reconsidering a number of client-managed streaming use cases, and implementing them using the network-assisted and server-managed adaptive streaming approach; and
- suggest a few features that need to be standardized to fulfill requirements generated from those use cases.

With this presentation, we hope to gauge interest and participation in developing a healthier web video streaming ecosystem that supports network assistance and server management.