IRate: Initial Video Bitrate Selection System for HTTP Streaming

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Extended Abstract. Video streaming is currently one of the most popular web applications. While HTTP streaming delivers video with a static bitrate, DASH (Dynamic Adaptive Streaming over HTTP) can change the video bitrate during the video playback. These two methods provide video streaming service on the existing web architecture. The video clips are hosted as web objects and are accessed using HTTP.

Currently, HTTP streaming and DASH tend to choose a low initial video bitrate to prevent clients from suffering a long buffering time. Delivering at a low bitrate also under-utilizes network resources and cannot provide the best QoE (Quality of Experience) to users [4]. Even though DASH ramps up the quality for fast clients during the streaming [1], frequent switching of bitrate can hurt the QoE [5].

Knowing the network conditions before streaming is critical in selecting the bitrate. However, existing tools for measuring network performance either incur a high overhead or are difficult to deploy. For example, flooding-based tools (e.g. speedtest services) can be implemented with web technologies, but they often generate a high overhead. Probe-optimized measurement tools (e.g., Pathload) require extra software installation and cannot be easily deployed in browser [3].

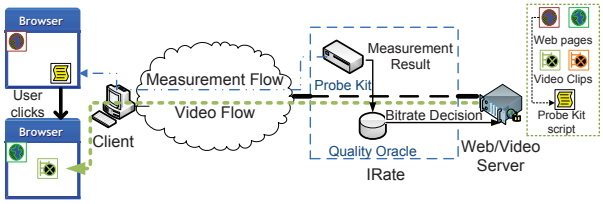

Figure 1: An Overview of IRate.

In this poster and demo, we propose IRate for selecting initial video bitrate on the server side. IRate is easy to deploy, and offers light-weight network measurement which is supported by most devices. Figure 1 shows the overview of the IRate. IRate is an IP-less system installed in front of the web/video server. Hence, the modification required to the server and clients are kept to minimal. The server is only required to host a set of small-size probe kit scripts and slightly modify the web pages, while clients do not need to install any extra software. The system is composed of two components–a *probe kit* to measure network path performance and a *quality oracle* to determine client's initial bitrate.

The probe kit exploits the user think time to deliver the probe kit script and measure the network with TRIO [2]. As the measurement logic is implemented in IRate on the server side, the script runs on the client side is only for establishing a TCP measurement flow and preparing data packets. The script has both Flash and HTML5 version, which are supported by the desktop/mobile browsers.

The measurement results are passed to the quality oracle in real time. The core of the oracle is a decision tree trained with Internet and testbed experiment results. The video bitrate in HTTP streaming and DASH has about 5 discrete levels. Hence, the oracle can determine the initial bitrate level rather quickly. When users access the video loading page, the web server can read the decision and generate the respective URL of video object in the page. Finally, the measurement flow stops and thus it will not compete network resource with the video flow.

Our results show that IRate can select a suitable initial bitrate, which can utilize the TCP throughput to archive a higher-than-lowest bitrate (if possible). By providing a better picture quality, the QoE can be improved.

Demo. A prototype of IRate, a web server and a few clients will be setup on-site. They are connected to a router configured with several sets of QoS parameters to emulate different network conditions. So, the clients start streaming with different initial bitrates.

References

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