Depth First Real Time Search Method for Video Streaming Over Multiple Wireless Networks: An Overview

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Abstract: **Video streaming is highly challenging to provide high quality video streaming services for mobile users consistently due to limited computational capacity, energy supply and dynamic change in wireless channels. It is gaining more popularity among mobile users. Though progressive download is highly used it has disadvantage. It is not possible to maintain very large buffer in smart phones. If the user turns off the video player in middle then the buffered unwatched video may go waste.**

The latest mobile devices, such as smart phones and tablets, are equipped with multiple wireless network interfaces. In order to maintain high video streaming quality while reducing the wireless service cost, the optimal video streaming process with multiple links is formulated as a Markov Decision process (MDP). This paper provides an overview of video streaming and MDP in real time. We close by are sharing our opinions on what some of the important open questions are in this area as well as our thoughts on how the adaptive depth first real time search algorithms can be improvised so that might seek out best answers.

Keywords: Markov Decision Process, Video Streaming, Progressive download, Adaptive bit rate streaming, Depth first real time.

I. INTRODUCTION

Streaming media is multimedia that is constantly received by and presented to an end-user while being delivered by a provider. A client media player can begin playing the data (such as a movie) before the entire file has been transmitted.

Distinguishing delivery method from the media distributed applies specifically to telecommunications networks, as most of the delivery systems are either inherently streaming or inherently non-streaming. Utilizing multiple links simultaneously can improve video streaming in several aspects: the bandwidth can be aggregated which supports the higher bit rate. If multiple links are used, suppose when one wireless link suffers poor link quality or congestion, the others can compensate for it. High resilience to bandwidth variation and easy deployment are both important requirements for video streaming applications.

Multimedia streaming technologies based on Hypertext Transfer Protocol (HTTP) are very popular and used by many content providers such as Netflix, Hulu and Vudu. ISO/IEC MPEG has ratified DASH (Dynamic Adaptive Streaming over HTTP) which extends traditional HTTP streaming with an adaptive component addressing the issue of varying bandwidth conditions that users are facing in networks based on the Internet Protocol (IP). These features may introduce drawbacks when multiple clients compete for a network bottleneck due to the fact that the clients are not aware of the network infrastructure such as proxies or other clients.

In order to improve the performance even further, the video segments are divided into smaller logical sub-segments. The sub-segments will reduce the number of playback interruptions and increases the average video quality significantly. However, this sub-segment approach has a weakness—segments are divided into xed-sized sub-segments.

II. TYPES OF DOWNLOADS

1. Progressive Download

It is the transfer of digital media files from a server to a client, typically using the HTTP protocol when initiated from a computer. The consumer may begin playback of the media before the download is complete. The key difference between streaming media and progressive download is in how the digital media data is received and stored by the end user device that is accessing the digital media.

A media player that is capable of progressive download playback relies on metadata located in the header of the file to be intact and a local buffer of the digital media file as it is downloaded from a web server. The technical definition of "progressive download" is video delivered by a regular HTTP web server rather than a streaming server.

2. Adaptive bit rate streaming

Adaptive bit rate streaming works by detecting a user's bandwidth and CPU capacity in real time and adjusting the quality of a video stream accordingly. It requires the use of an encoder which can encode a single source video at multiple bit rates. The player client switches between streaming the different encodings depending on available resources. The result will be very little buffering.

Adaptive streaming technologies encode multiple live or on-demand streams and switch them adaptively based upon changing line conditions and other variables. When the connection is good, the viewer gets a high-quality, high-data-rate stream, but if connection speed drops, the server will send a lower-data-rate file to ensure a continuous connection, at lower quality. Adaptive streaming provides the best of all possible worlds: great quality-video for those with the connection speed to retrieve it and a passable-quality stream for those with Wi-Fi, mobile or other slow connections on lower-power devices.

III. MARKOV DECISION PROCESS

DASH (Dynamic Adaptive streaming over HTTP) is a type of adaptive bit rate streaming system, in which the multiple copies of pre-compressed videos with different resolution and quality are stored in segments. The rate adaptation decision is made at the client side. For each segment, the client can request the appropriate quality version based on its screen resolution, current available bandwidth, and buffer occupancy status.

Once the video segment is requested by the client, based on the available bandwidth and other parameters the best action is taken based on MDP. The video streaming process over multiple links is formulated as an MDP problem. To achieve smooth and high quality video streaming, several actions and reward functions for each state can be designed. The adaptation algorithm takes into consideration few steps to avoid playback interruption and achieve better smoothness and quality.

IV. DEPTH FIRST REAL TIME SEARCH

Utilizing multiple wireless access networks together for video streaming, e.g., using a combination of cellular, WiFi, and/or Bluetooth simultaneously has to be considered. As an example, Bluetooth and WiFi access networks are considered as there is no end-to-end control over cellular links and this work can be extended when other types of wireless access networks or more than two wireless accesses. Since a wireless channel may suffer from time-varying fading, shadowing, interference and congestion, the available bandwidth of a wireless link may vary all the time.

After initialization, the video streaming occurs in step by step process. Here two wireless networks WiFi and Bluetooth are used. The rate adaptation agent requests the video segment of appropriate quality based on the available bandwidth and queue length. The request decision is made through both WiFi and Bluetooth simultaneously for video segment.

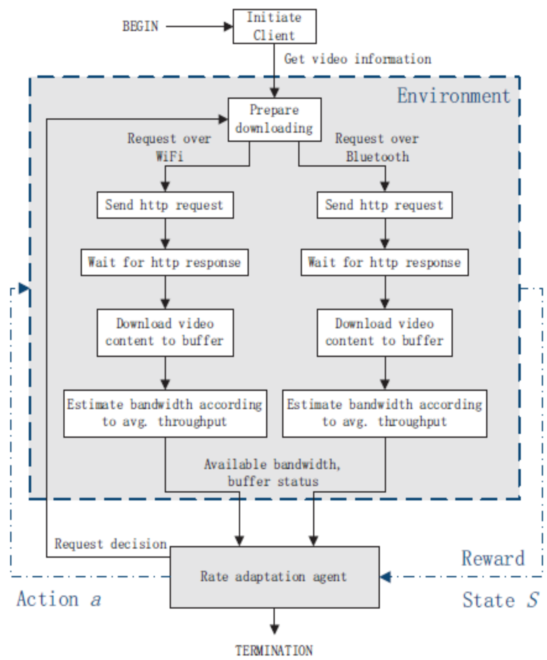

Fig. 1. System Model.

Each segment of video is getting downloaded and the process continues till the completion of the request or termination of video by user. The above video streaming is the interaction between two modules. The environment sends the state signal for each video segment to the agent. The agent will determine the best possible action based on the Markov decision process.

Rapid network load changes and short-term outages are difficult to predict, and the resultant available bandwidth for a session becomes a time-varying random process. Thus, instead of using a homogeneous Markov chain to estimate the available bandwidth, a heterogeneous and time-varying Markov model can be used to estimate the future bandwidth. The bandwidth of each link will be divided into several regions. Each region will represent a state of the Markov channel model, and the total number of the states is equal to the number of regions.

V. CONCLUSION

Multiple links can be used simultaneously to improve video streaming. The aggregated higher bandwidth can support video of higher bit rate. An appropriate video segment can be streamed based on the resource availability at the client side. A real-time adaptive best-action search algorithm can be used for video streaming over multiple wireless access networks. The video streaming process is formulated as an MDP problem. To achieve smooth video streaming with high quality, the reward functions are defined appropriately. Using the rate adaptation algorithm, the MDP can be solved to obtain a sub-optimal solution in real time. This paper provides an overview of related work about how MDP can be used to obtain the best video streaming.

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