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Using Bandwidth Aggregation to Improve the Performance of Video Quality- Adaptive Streaming Over Multiple Wireless Access Networks

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Abstract: **Smart phone provides many multimedia services for mobile users. Most of these smart phones are equipped with multiple wireless network interfaces (that support real time video processing. How to use efficiently and cost-effectively utilize multiple links to improve video streaming quality over multiple wireless access networks . In order to maintain high video streaming quality while reducing the wireless service cost, In Video quality-adaptive streaming, the optimal video streaming process with multiple links is formulated as a Markov Decision Process (MDP). The reward function is designed to consider the quality of service (QoS) requirements for video traffic, such as the startup latency, playback fluency, average playback quality, playback smoothness and wireless service cost. To solve the MDP in real time, Quality-adaptive streaming propose an Adaptive search Depth algorithm to obtain a sub-optimal solution**.

Keywords: **Quality of Service, Markov Decision Process, Bandwidth Aggregation, Variable Bit Rate**.

I. INTRODUCTION

Smart phone provides many multimedia services for mobile users. Most of these smart phones are equipped with the wireless channels and devices (that support real time video processing).Video streaming is gaining popularity among mobile users recently. Considering that the mobile devices have limited computational capacity and energy supply, and the wireless channels are highly dynamic, it is very challenging to provide high quality video streaming services for mobile users consistently. It is a promising trend to use multiple wireless network interfaces with different wireless communication techniques for mobile devices. For example, smart phones and tablets are usually equipped with cellular, Wi-Fi and Bluetooth interfaces. Utilizing multiple links simultaneously can improve video streaming in several aspects: the aggregated higher bandwidth can support video of higher bit rate; 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. Currently, progressive download, one of the most popular and widely deployed streaming techniques, buffers a large amount of video data to absorb the variations of bandwidth. Meanwhile, as video data are transmitted over HTTP protocols, the video streaming service can be deployed on any web server.

However, the video quality version can VIDEO streaming is gaining popularity among mobile users recently. Considering that the mobile devices have limited computational capacity and energy supply, and the wireless channels are highly dynamic, it is very challenging to provide high quality video streaming services for mobile users consistently. It is a promising trend to use multiple wire-less network interfaces with different wireless communication techniques for mobile

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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. Currently, progressive download, one of the most popular and widely deployed streaming techniques, buffers a large amount of video data to absorb the variations of bandwidth. Meanwhile, as video data are transmitted over HTTP protocols, the video streaming service can be deployed on any web server. However, the video quality version can only be manually selected by users and such decision can be error-prone. Since the smart phones only have limited storage space, it is impractical to maintain a very large buffer size.

In addition, the buffered unwatched video may be wasted if the user turns off the video player or switches to other videos. Furthermore, progressive download typically does not support transmitting video data over multiple links. To overcome the above disadvantages of progressive down- load, dynamic adaptive streaming over HTTP (DASH) has been proposed.

In a DASH system, 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. This pull-based DASH scheme can be extended to support multiple links, i.e., let the client request different parts of one segment over different links. How to optimize this rate adaptation process for video streaming over multiple wireless links, considering the video quality of service (QoS) requirements, the wireless channel profiles, and the wireless service costs of multiple links is an open issue. In the video adaptive streaming, which formulate the multi-link video streaming process as a reinforcement learning task. For each streaming step, we define a state to describe the current situation, including the index of the requested segment, the current available bandwidth and other system parameters.

Devices capable of connecting to multiple, overlapping networks simultaneously is becoming increasingly common. For example, most mobile phone are equipped with WIFI and Bluetooth-interface, and smart phones can typically connect to both WLANs and 3G mobile networks. At the same time, streaming high-quality video is becoming increasingly popular. However, due to bandwidth limitations or the unreliable and unpredictable nature of some types of networks, streaming video can be subject to frequent periods of rebuffering and characterized by a low picture quality.

The multilink-enabled DASH client divides video segments into smaller subsegments, which are requested over multiple interfaces simultaneously. The size of each subsegment is dynamic and calculated on the fly, based on the throughput of the different links. This is an improvement over our earlier subsegment approach, which divided segments into fixed size subsegments. The quality of the video is adapted based on the measured, aggregated throughput. Both the static and the dynamic subsegment approaches were evaluated with on-demand streaming and quasi-live streaming.

A finite- state Markov Decision Process (MDP) can be modeled for this reinforcement learning task. The reward function is carefully designed to consider the video QoS requirements, such as the interruption rate, average playback quality, and playback smoothness, as well as the service costs. To make a trade-off between different QoS metrics and the cost, i can adjust the parameters of the reward function.

To solve the MDP in real time, quality-adaptive streaming proposed an adaptive best-action search algorithm to obtain a sub-optimal solution. A realistic testbed is implemented to better evaluate the performance of our solution. The main contributions of this paper are threefold. Quality-adaptive streaming formulate the video streaming process over multiple links as an MDP problem. To achieve smooth and high quality video streaming, we define several actions and reward functions for each state. Second, quality-adaptive streaming propose a depth-first real-time search algorithm. The proposed adaptation algorithm will take several future steps into consideration to avoid playback interruption and achieve better smoothness and quality.

Last, quality-adaptive streaming to implement a realistic testbed using an Android phone and Scalable Video Coding (SVC) encoded videos to evaluate the performance.

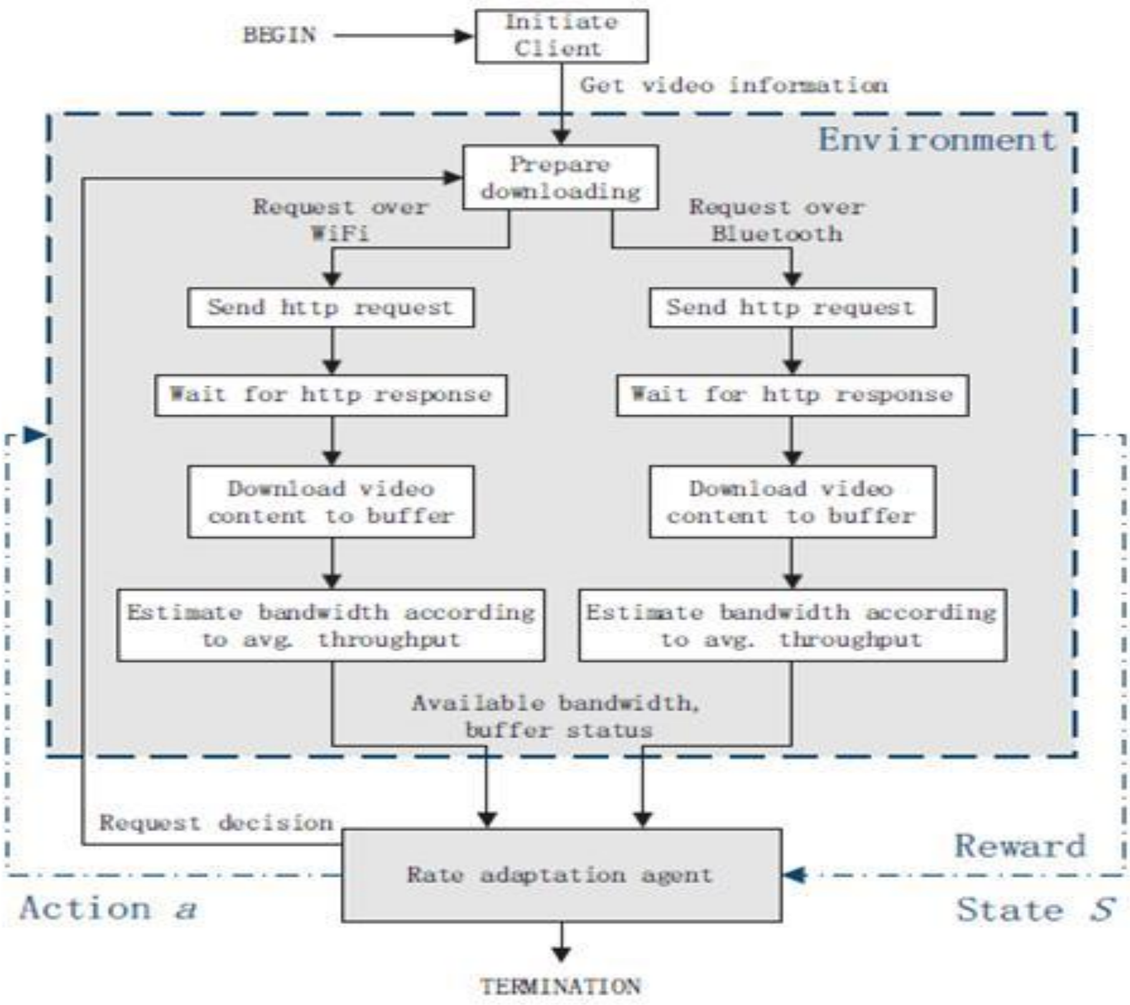

Fig 1. Architecture

For the Video Quality - Adaptive Streaming connect client application with wifi and Bluetooth which send Http request to fetch the video information.After sending Http request wait for response then once get respone from Http prepare the download video content to buffer. For Wifi and Bluetooth after download content to buffer it estimate bandwidth according to throughput of video. Bandwidth sended over to Rate Adaptation agent to calculate which bandwidth is better to view video content to prepare download.

II. PROPOSED SYSTEM

Video Streaming proposed dynamic adaptive streaming over HTTP has been proposed. In a DASH system, multiple copies of pre-compressed videos with different resolution and quality are stored in segments. Video streaming formulate the multi-link video streaming process as a reinforcement learning task. For each streaming step, video streaming define a state to describe the current situation, including the index of the requested segment, the current available bandwidth and other system parameters. A finite state Markov Decision Process (MDP) can be modeled for this reinforcement learning task. The reward function is carefully designed to consider the video QoS requirements, such as the interruption rate, average playback quality, and playback smoothness, as well as the service costs.

Video streaming first how to better allocate the loads between several links with finer granularity. Second, to better predict the future bandwidth, the most recent estimation of bandwidth should be assigned with a higher weight. Last but not least, the size of the video segment should be further considered for variable bit rate (VBR) videos to improve the bandwidth estimation accuracy.

Quality-adaptive streaming have a smooth and high quality video streaming and also Avoid playback interruption and achieve better smoothness and quality.

III. PROBLEM IDENTIFICATION

The Mobile phone comes with no guarantees about performance, and a vast number of things can delay a streaming video. There can be problems Latency, Playback fluency, Average playback quality, Playback smoothness and Wireless service cost.

The video quality version can only be manually selected by users and such decision can be error-prone. Since the smart phones only have limited storage space, it is impractical to maintain a very large buffer size.

Streaming in varying network conditions can be greatly improved when network conditions are successfully predicted. Variations in connectivity can be smoothed out over time if those variations can be successfully predicted.

There are a number of problems that will have to be solved to develop good bandwidth prediction algorithms, such as how to cope with inevitable mispredictions, how to make the prediction algorithm scalable (some algorithms can be extremely expensive computationally), and how to optimize for perceived quality while at the same time avoiding buffer underruns and not wasting bandwidth (e.g., ending a streaming session with too much unused video in the buffers).

Understanding the network conditions in mobile networks is crucial when designing streaming policies. It is not possible to develop adaptive video streaming policies without a solid understanding of the underlying network characteristics, so the first step to be taken is to experimentally gather knowledge about the network conditions experienced by mobile receivers.

For a video streaming application, there are only three ways to handle fluctuating network bandwidth: (1) Accept loss of data, (2) try to outlast the bandwidth starved periods through advanced buffering, and (3) reduce the bitrate of the video stream according to the bandwidth that is available.

IV. IMPLEMENTATION RESULTS

A. Mobile phone connected to PC via USB:

For Video Quality - Adaptive Streaming here mobile phone connected to PC via USB for install the video download application. Fig 2 shows connected to PC via USB

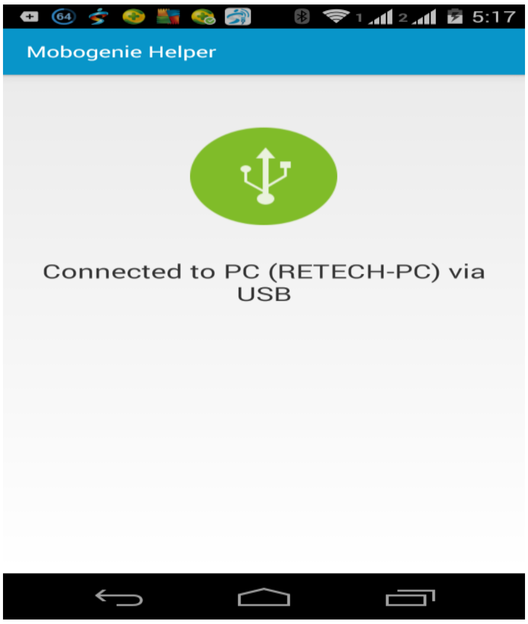

Fig 2. Connected to PC via USB

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I. Video Stream:

Here is screen shot explain that send HTTP request to video contain portal which fetch content of video information to buffer. HTTP is an TCP/IP based communication protocol, which is used to deliver data. Fig 3 shows the Video Stream- Send HTTP Request.

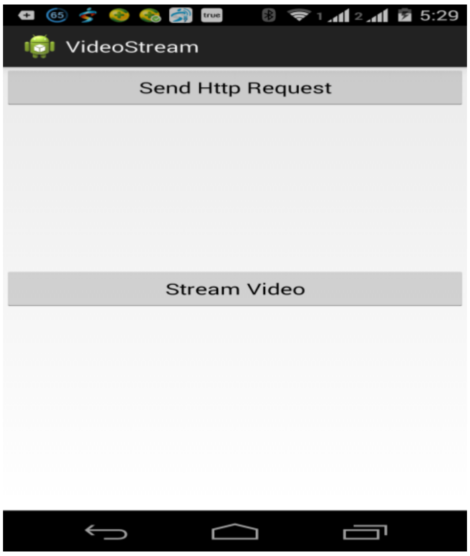

Fig 3. Video Stream – Send Http Request

It shows some requested video which ready to streaming or download. Once we click the particular video file to buffer in video device for Http portal.

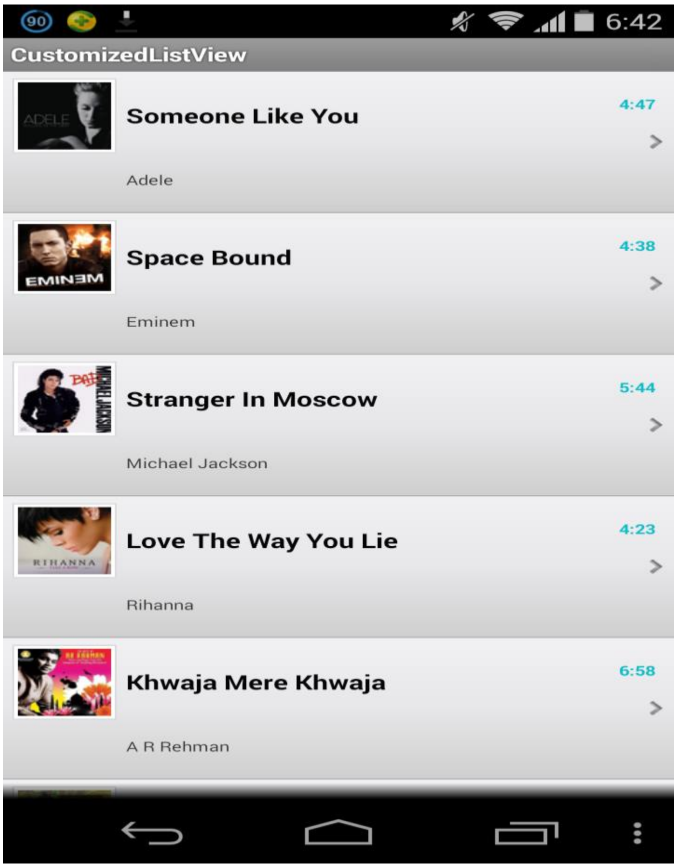

Fig 4. Customized List View

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II. Video Stream – Buffering:

Buffering the program must wait until the finished video is copied or swapped before starting the new video. A buffer contains data that is stored for a short amount of time, typically in the phone memory (RAM). The purpose of a buffer is to hold data right before it is used.

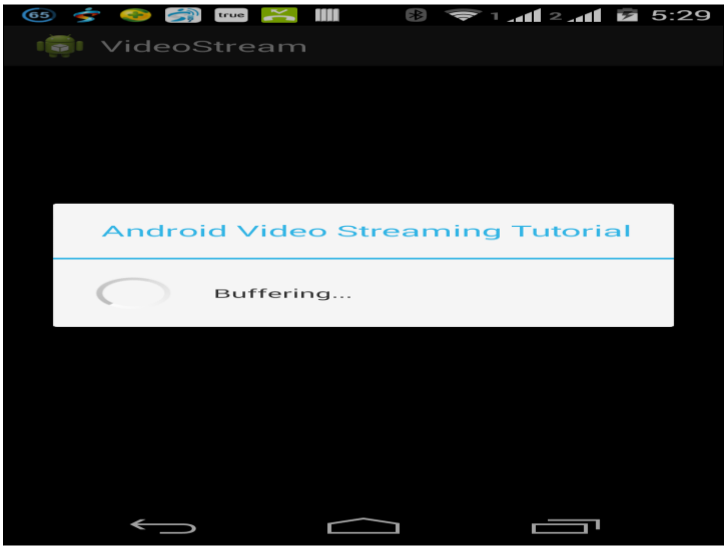

Fig 5. Video Stream – Buffering

III.Video Stream – Bandwidth & Speed:

After buffering it show bandwidth allocated for video and also show the speed for video. Bandwidth is the bit-rate of available or consumed information capacity expressed typically in metric multiples of bits per second. Variously, bandwidth may be characterized as network bandwidth, data bandwidth, or digital bandwidth. It shown two various bandwidth on Rate adaptation agent *(*Using Bandwidth Aggregation*)*which allowed better bandwidth to streaming. Fig. 6 shows the different different bandwidth and speed of video stream

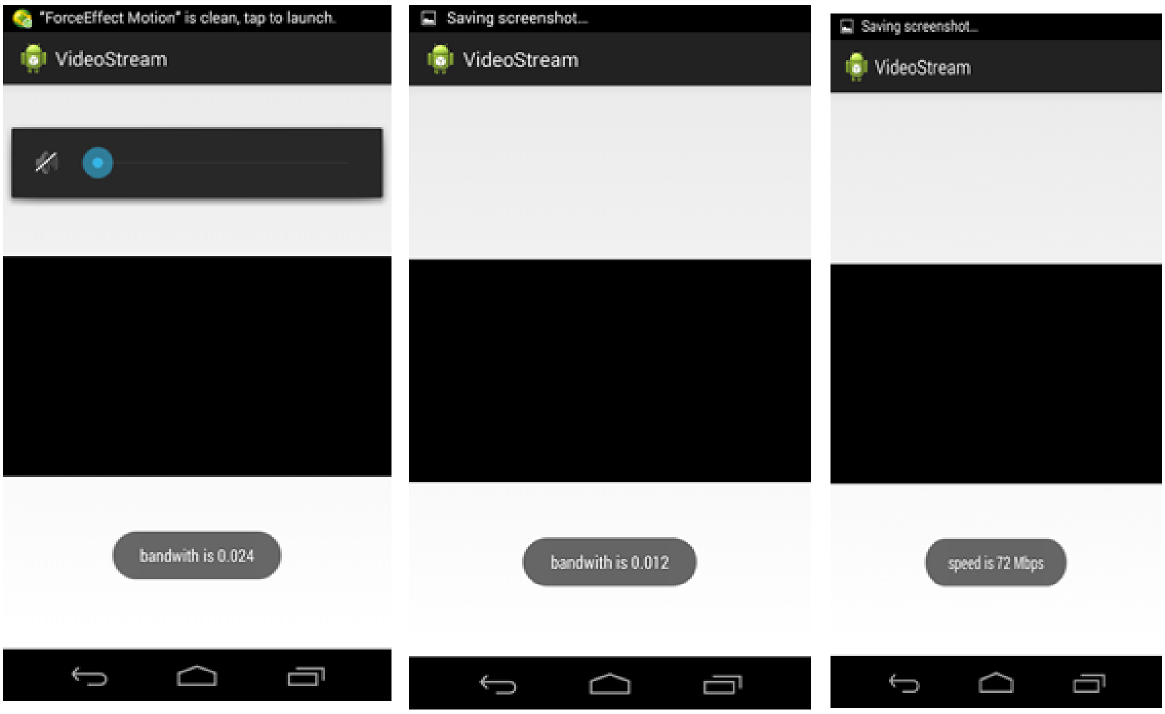

Fig 6. Video Stream – Bandwidth & Speed

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After bandwidth and speed deterninated. The video duration time dependent on video frames. Using Bandwidth Aggregation here video streaming start and end with same quality Over Multiple Wireless Access Networks**.**

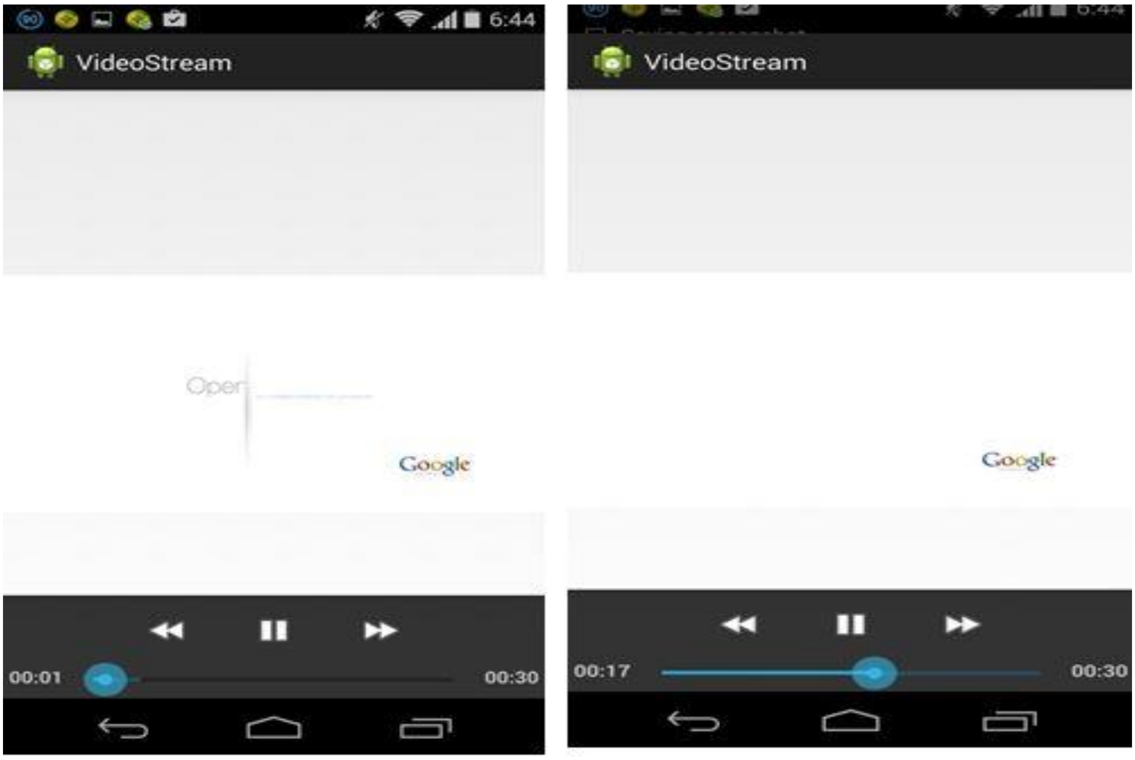

Fig 7. Video Stream Quality

V. CONCLUSION

In the Video quality-adaptive streaming proposed a real-time adaptive best-action search algorithm for video streaming over multiple wireless access networks. First, adaptive streaming formulated the video streaming process as an MDP. To achieve smooth video streaming with high quality. Quality – adaptive streaming to better allocate the loads between several links for the most recent estimation of bandwidth assigned with higher weight. Video quality-adaptive streaming can avoid playback interruption to achieve a lower startup latency, higher video quality and better smoothness.

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