Survey on Concurrent Multipath Scheduling for Real Time Video Streaming in Wireless Network

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Abstract:

Concurrent multipath scheduling algorithm enables efficient use bandwidth in wireless network. Multipath transport protocol provides use of multiple wireless network wi-fi, cellular network concurrently. While using bandwidth of available network channels the parameters like network path congestion, packet loss rate, etc. should have calculated accurately. Everyone wants video should be streamed smoothly for that only one network path is not capable. As mobile devices and laptops support more than one wireless network access so they can be used to stream video fast. In recent studies quality Driven multipath transport control protocol (ADMIT) uses the maximum bandwidth concurrently in wireless network. In this protocol the analytical model shows the communication between sender and receiver using forward error correction coding. The multipath protocols analyze the network properties to schedule the packets over available network paths. The sender predicts the next packet path by analyzing the previous packet delivered. The optimization strategy used to find efficient path by using the network constraints. Concurrent multipath scheduling algorithms are reduced end to end delay in the video encoding and decoding. The simulation shows the video quality required for real time video streaming is achieved by multipath scheduling algorithms. The distortion calculated is minimum shows in received frames by calculating average peak signal to noise ratio.

Keywords **-- packet scheduling, forward error correction coding, wireless networks, bandwidth aggregation.**

Introduction:

In video streaming first video is shooting by the high definition camera then from the server, it will be streamed. There is so much use of real time video streaming in live games, video conferencing, business organizations, hospitals, etc. Real time video streaming in high quality requires more bandwidth in the range of 3 to 5 mbps [6]. Nowadays everyone wants high quality video above 720 pixels. The mobile phones support multiple wireless networks wifi, cellular data like 4g [4]. These networks concurrently used by multipath transport control protocols. 4g network provides bandwidth in the range 3 to 5 mbps. To use that bandwidth efficiently congestion control is analyzed by the server. The current iphone devices and Samsung galaxy s5 series mobile phones provide bandwidth aggregation that uses simultaneously both wireless network accesses [4]. In multipath transmission control protocol the packet delay causes unnecessary loading the video. In forward error correction technique discard that overdue packet. The frames contain so much redundant data. When one shot is considered, the background in the images is same [9]. There is no need to transmit same data in each frame. To calculate redundancy cosine ratio is used. The colors represent on x and y axis. Using direct cosine transform, calculate the difference between the frames. While using wireless networks the main challenge is to find network characteristic. The network bandwidth is continuously fluctuating, so the

predicted packet delivery is not calculated accurately. The distortion caused in the streaming the video is mostly due to bit change in the network and decoding the encoded bits [7-8]. The concurrent multipath transport distortion aware (CMT-DA) protocol schedule packet in wireless network so that the distortion at receiver side is less than 90%. The inter packet delay should be less than 40 milliseconds. In real time adaptive algorithm, the Morkov Decision Processing (MDP) decides the network quality and according packet scheduling done by the server [3]. First make the connection using http protocol. Rate adapting agent saves the different copies of video. According to the bandwidth the video segment is played for smoothness of the video [3].

Most of the users of internet access data in the form video. Almost 70% data from the internet is accessed in the form of video and it is increasing day by day. Many applications become famous like hotstar, youtube and voot app for streaming video. In video streaming the whole video cannot downloaded at once [9]. The data is sending in the blocks and that blocks are played [2]. The different algorithms uses variables block size and fixed block size. In variable block size sender has to get feedback for received block to send next block. In forward error correction method no need to retransmit packet. The single bit error is corrected at receiver by adding parity bits [7].

II. Different protocols for concurrent multipath scheduling

A) Bandwidth-Efficient Multipath Transport (BEMA) Protocol for Quality-Guaranteed Real- Time Video over Heterogeneous Wireless Networks:

In BEMA author Jian Wu presents priority aware multipath scheduling using priority aware and minimum bandwidth consumption [5-6]. The video data is send using raptor codes to detect and recover error. The video data is send according to delay and distortion constraints. For quality video access the end to end delay caused in network by network congestion, retransmission of packet. The distortion in the network is calculated by using distortion while decoding the frame and distortion in transmission. For video encoding raptor codes adds redundant information to the FEC coding blocks. The group pictures contain different types of frames. These frames are divided into blocks [6]. For video streaming applications, head of line blocking may cause incomplete or late frames to be discarded at the receiver, as well as stream stalling. In this work, we propose a couple of path schedulers and evaluate video streaming performance under these schedulers [2].
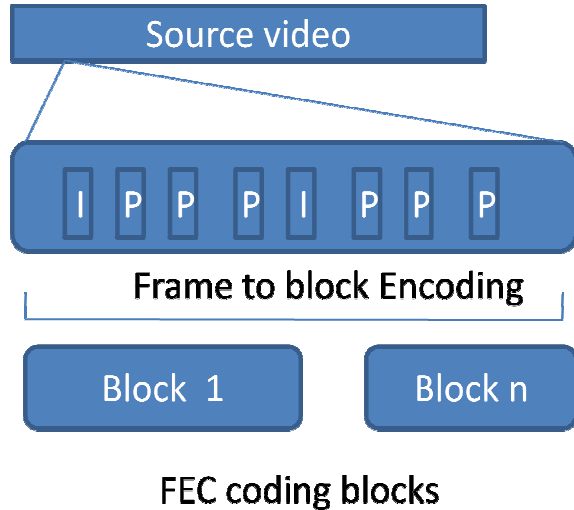
Fig 1. Raptor coding in video frames

In fig. 1 source video contains different frames such as I and P frames. I frames are independent frame and P frame is predicted frame. Predicted frames contains data from I frames. The blocks contain encoded data for error correcting.

B) A Real- Time Adaptive Algorithm for Video Streaming over Wireless Access Networks

In this paper author Min Xing presents a novel technique for concurrent multipath transport using Markov Decision Processing. The Markov Decision Processing (MDP) depends on the quality constraints like network path quality, playback time, bandwidth consumption. In the system model author connect server with multiple wireless devices like wi-fi, Bluetooth and 4g cellular network [7]. The different wireless networks have different properties. When data is accessed through cellular 4g network, the connectivity is good and individual bandwidth consumption. When wi-fi network is considered the connectivity and range is better than cellular network but bandwidth is depend on number of users. In this protocol most traffic is send through the wi-fi network and if not available uses the cellular network [6-7]. The main objective of this protocol is to play video smoothly with minimum bandwidth consumption. The rate adaptation agent decide the flow of traffic depend on previous delivery of packet consumed bandwidth. The video is divided into different segments. The segments are unplayed and available in the buffer. The highest size segment has best quality of the video. The total traffic downloaded by the Bluetooth or wi-fi is recorded for the previous segment to predict next path allocation for the video segment. For playing video smoothly, the different copies of the video are stored at the server. To calculate bandwidth is main challenge because in wireless network the parameters are continuously fluctuating. The MDP estimate available bandwidth and throughput depend on historical data. The algorithm for real time best action estimates how long should segments are send through one network depend on optimal solution [7].

The real time adaptive algorithm fids best path for video transmission and reduce playback latency. The video quality is improved by using MDP. The multiple copies of the video segment cause memory overhead.

III. Concurrent Multipath Scheduling Approaches

There are two approaches of concurrent multipath scheduling variable bit rate (VBR) and constant bit rate (CBR)

A) Variable bit rate:

In variable bit rate the amount of encoded data send through the network channel is varied according to the channel capacity. After encoding the vide data, the transmission environment choose the bit stream to transmit to the receiver. The encoders are used to encode the video data are H.264, MPEG-2, etc. These are standard encoders which are supported by the maximum video players. For varying bit rate the sender should aware of the network characteristics such as packet loss in the network, delay required to decode the frame and network bandwidth [1-6].

B) Constant bit rate:

For constant bit rate video encoding, the predictive network characteristics is used. In variable bit rate video encoding the receiver has to give feedback for decoded packets. The decoder has to wait for feedback; it increases the playback latency [5]. In constant bit rate, the delay is caused only for removing decoded packet from the buffer. The bit rate depends on the delay and the buffer size. The only challenge is to reduce underflow of the buffer. The memory size for the buffer should be efficient so that minimum end to end delay and less distortion [1].

IV. Conclusion

Video streaming using concurrent multipath transport provides less end to end delay. The distortion in video streaming is less for good video quality. The different rate distribution algorithm provides efficient use of bandwidth. To meet good video quality the parameters like delay, jitter, packet loss rate are considered in concurrent multipath algorithms. The encoder encoded priority aware packets in BEMA over

content agnostic algorithms. The video encoding and decoding using raptor codes and reed Solomon codes provides data protection over wireless networks. As wireless networks are more error prone the rate adaptation algorithm gives better peak signal to noise ratio in the received frames. In future most of concurrent multipath algorithms based on variable bit rate for efficient bandwidth consumption.

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