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ADAPTIVE STREAMING ALGORITHMS AND NETWORK PROTOCOLS

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Abstract: Two Actually the quality and speed of the transmission capacity of users has become one of the problems that will challenge the architecture of server networks and their administrators, so adaptive transmission is proposed as a solution since it allows Dynamic adap- tation of the velocity of the flow velocity and we will focus on the type of architecture based on the receiver, that is, an adaptation algorithm that does not delay the information to pass from one layer to another or with server requests. Adaptive transmission in mobile networks is also pos- sible and the main difference of these algorithms is the amount of initial information parameters required for their operation. After this information, a performance experiment was performed where video signals were made through each of the algorithms mentioned above. Three of these types of algorithms presented a passive input, while the adaptation algorithms did not affect the behavior of the output beyond the segment where it began to run.
Keywords: Streaming, HTTP, Algorithms, Protocols.

INTRODUCTION

A comparison was made between the technologies of the existing adaptation algorithms, among which we find the PANDA Festive [6] and [7] the ABMA + [8] Y, the BBA [9] and BOLA [10]. The BBA [9] and BOLA [10] are based on the Buffer- based adaptation, the PANDA 6 is a performance-based adaptation of four stages. The ABMA algorithm demonstrates the adaptation based on time, within the tests there are 4 types of inputs: Live transmission and stored, within this transmission under normal conditions and in high network traffic conditions. The live and saved transmission does not present important changes when the algorithms are presented, the algorithms of adaptation based on BUFER presented the best performance, that is to say the algorithm BBA and BOLA.

ADAPTIVE STREAMING ON HTTP

To start to discuss some of the algorithms that exist, we must first analyse the con- cept of adaptive streaming, then we will see its use through the HTTP protocol. Then we will see implementation of adaptive streaming across networks that typically found in homes and finally a case of comparison of mobile networks. The concept of stream- ing has become much more popular years when it's comparit information through video with a lot of user, typically a transmission is made live and in real time, however; There is also the option of storing the transmission to be stored and possibly then request the content many times you want. However, since it is a technology that currently have high demand both quality and speed of transmission capacity of users is one of the issues that will test the architecture of networks of servers and their administrators. Within the large amount of technologies, here we will detail the known as adaptive streaming, it is characterized by allowing that the speed of the stream rate adapts dy- namically depending on the changing conditions of the network. At the same time var- ious types of architect of this there are type of adaptive technology, but in this case will be presented the approach of the receiver-driven approach, in which the content files are subdivided into segments, and each of these segments sent to different speeds. In this technology the customer has the task of selecting the rate of speed for each of the segments.

The next challenge that you can appreciate in this technology is that to ensure opti- mum quality of the steaming should calculate and contain unnecessary fluctuations in data. Finally, to restrict the maximum possible the delay of transmission, independent of the delay of network or equipment is available,

must be that the user requests not bounce between different servers as if content makes it along transmission, in this case requests should particularly have a direct channel with the server that provides the con- tent. To solve the various problems mentioned above, there are many algorithms de- signed and studied around the world that are able to control the fluctuations of the net- works where they are implemented. A particular case is an adaptation algorithm re- ceiver-driven for adaptive streaming not delaying information to pass from one layer to another, or with requests for servers. This algorithm was integrated with implementation prototype for a user based on the DASH MPEG streaming client (Dynamic Adap- tive Streaming over HTTP) [1]. MPEG DASH is an international standard which uses the already existing traditional HTTP web servers infrastructure and has become very popular in recent years to try to cope with the growing demand for traffic videos [4].

Under the conditions that evaluated the prototype we collected considerably good results under challenging conditions, and remained even stable if the transmission was given to multiple users simultaneously.

Finally the BBA [9] and BOLA [10] are algorithms based on the buffer, that is, on a map of segments that divides the flow of information and is defined by the available values of maximum and minimum quality. In addition, it increases the average quality of the transmission and avoids application conflicts on the server.

ADAPTIVE STREAMING IN MOBILE NETWORKS

We now turn to observe approaches to Adaptive algorithms in mobile networks. Within this class of network technology that has become known as the key solution for the transmission of videos is called searched (HTTP Adaptive Streaming). In mobile networks globally, approximately 60% of the traffic in 2016 has been to transmit video files; also projected that it will continue to grow and increase with the passing of the years [2]. A lot of that traffic is video-on-demand (VoD) streaming through the Protocol already mentioned have [3].

Over the years, have been developed multiple classes of algorithms looking to increasingly improve the Quality of Experience (QoE) [5] users through the adaptation of transmission speeds. The main difference of these algorithms is the amount of initial information parameters that require for their operation, this amount varies from transmission application layers, as well as the size of the buffer of delays.

Some comparisons between technologies of existing adaptation algorithms, which include three main categories will later be evaluated. Firstly, we have the throughput-based algorithms, such as PANDA Festive [6] and [7], which based their decisions or determinations on the captured TCP exits, which to be used need a sufficient number of tests to run and get the required parameters. Secondly, we have the time-based algorithms as ABMA + [8], these are also based on the same principle of a number of tests for the control parameters, but in this case use the estimated times of discharge of each segment of the streaming transmission. Finally, we have the buffer-based algorithms, such as BBA [9] and BOLA [10], that class of algorithms to observe and react to the size of the buffer of delays from customers. [11] considers a practical three kinds of adaptive algorithms already mentioned, debate highlighting the General characteristics of each and explaining more to fund their operating principle.

THROUGHPUT-BASED ADAPTATION

The scheme in which these algorithms are based is based on an Adaptive model of four stages, where the bandwidth of the network availability is estimated using first- order noise filters to prevent errors of estimation in the variations of the output. Then the rate of transmission of the video speed is indicated based on discretized output of the previous point. And in this way following a predictive scheme is expected once the time between request-transmission is calculated.

Within any specific to this type of algorithms variants have the aforementioned PANDA [6], which modifies the model of four stages in two parts. A much more pro- active test facility, which is used to reduce as far as possible the fluctuations of rates of change of the speed transmission is used in the estimation stage. The second modifica- tion to the conventional paradigm is the step of prediction, where by a controller that uses the maximum size of the buffer client can match the estimated download time with considered solicitud-salida of the server time.

BUFFER-BASED ADAPTATION

Within this category we have the aforementioned BBA and BOLA. BBA is a type of well-known algorithm, which is based on a map of segments that divides the flow of information, said map or drawing is defined by two parameters, which are the available values of maximum and minimum quality available respectively d and the network, and the Strip is expected to keep the size of the segments to be within the parameters of quality control without affecting the speed of transmission.

On the other hand, we have the algorithms of the BOLA class, which is characterized by using a block of optimization of Lyapunov equations to calculate the optimal trans- mission speed of each segment. This algorithm was made to try to increase the average quality of transmission, avoiding or isolating potential occurrences of conflict of appli- cations on the server.

TIME-BASED ADAPTATION

For this kind of algorithms, is the main control parameter is the discharge of each segment or packet transmission time. This differentiates them from class Throughput-based algorithms. The aforementioned algorithm ABMA +, is part of this category, and is defined as an algorithm for adaptation and management of buffer, which selects the representation of video based on the probability predicted based on stagnation of the transmitted segments. The algorithm runs continuously estimated download times of the segments in which transmission packets are divided. In addition, it uses a flat pre calculated based on the buffer to select the maximum representation of possible video, which guarantees the quality of the transmission and prevents stagnation of infor- mation.

PERFORMANCE EXPERIMENT

The following figure shows the characteristics of video signals used for the experi- ment.

These signals were made through algorithms of each one of the classes that we saw earlier. An example of the behaviour of three kinds of algorithms below is on a passive input.

You can see that outputs of systems regardless of the class of adaptive algorithm used does not affect the behaviour of output beyond the segment where he began to run.

For tests that were implemented are distinguished four types of entries, live broad- cast and saved, and within these two transmission have in normal conditions and in conditions of high network traffic. The first test was carried out to identify the adapta

Repre-sentation index	esolution	BBB Max encoding rate (Kbps)	TSA Max encoding rate (Kbps)	RBPS Max encoding rate (Kbps)	CDF 0.05 Quantiles
1	20x240	129	128	149	0.01
2	80x360	378	330	395	0.05
3	54x480	578	754	700	0.1
4	280x720	985	1331	1536	0.25
5	280x720	1536	2048	2048	0.5
6	20x1080	2353	2764	2560	0.75
7	20x1080	2969	3481	3072	0.95

Table 1: Characteristics of video signals Characters

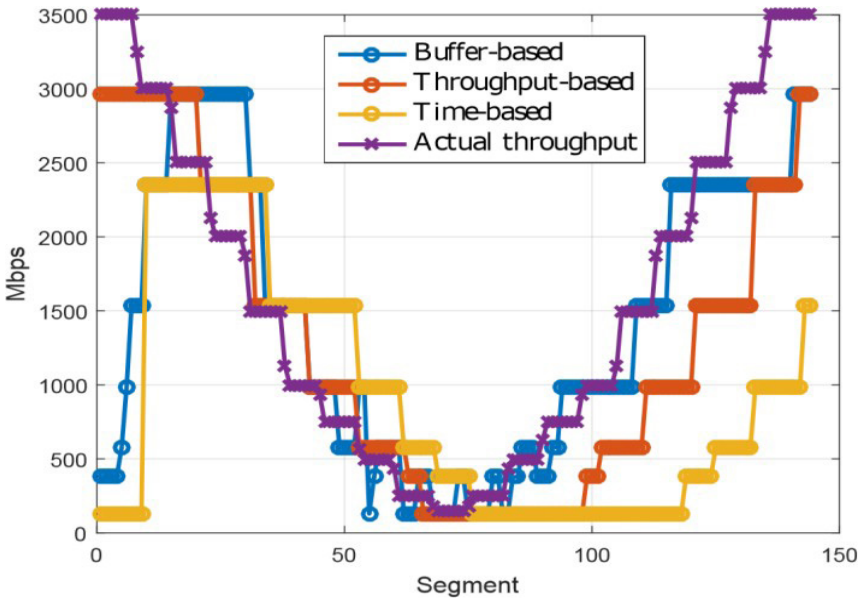

Figure 1: Outputs of systems regardless From [11]

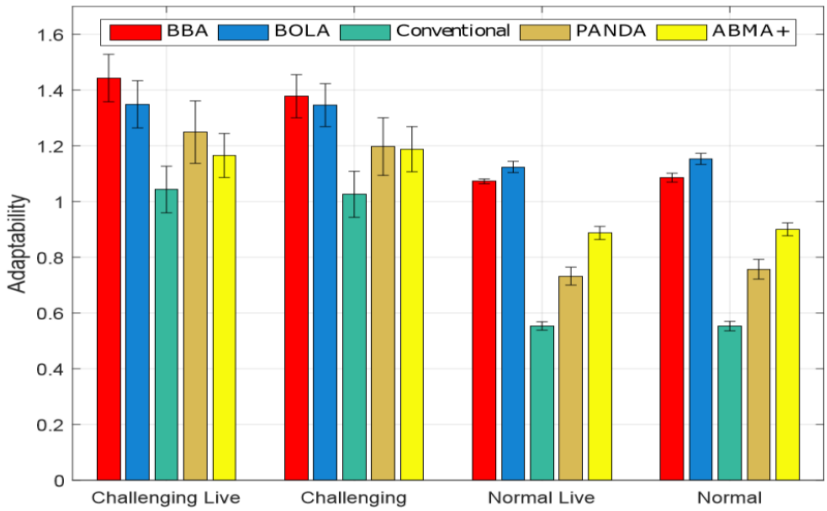

Figure 2: Transmission live From [11]

bility of the algorithm.

For tests that were implemented are distinguished four types of entries, live broad- cast and saved, and within these two transmission have in normal conditions and in conditions of high network traffic. The first test was carried out to identify the adaptability of the algorithm.

It is can demonstrate that the behaviour of a transmission live and saved does not present major changes when the algorithms are implemented. Below are the results for the adaptability of the frequency.

For these parameters clearly class buffer-based adaptation algorithms presented the best performance. Then the adaptation to amplitude.

From these findings we can conclude that the best adaptation values are also pre- sented by the BBA and BOLA algorithms.

RELATED WORK

According to Kathie Nichols and Van Jacobsen, in 2012 they discovered that the crucial point of the high traffic of information sent over the Internet was generated in the queue and there were two critical points: the interval and the threshold. So they created the technique called CODEL, which consists of managing the queue by means of a time tracking, that is, the packets are randomly decremented if an interval value has more delays than arrival points. This method presented a superiority with respect to the general latency specifically in the wireless access links

fcCODEL, was created by Dave Taht, Eric Dumazet, Jim Gettys, with the objective of generating an equal effect in the different flows through the queue, that is, dividing the queue into 1024 subqueues by default and consequently each new flow is randomly delegated to each separate queue and in this CODEL is assigned, which controls TCP congestion

According to a study by the Universidad Javeriana located in Cali, Colombia, a possible solution is to give the opportunity for the routers and switches in the network to behave differently according to the types of service while the traffic passes through the network. This is known as Differentiated Services (DiffServ) or QoS, which allow co-existence in the network without consuming the bandwidth between the different ac- tors, which means that important flows are used before lower priority flows and that there is also a control of the amount of bandwidth and races between the applications.

Another solution to the problems developed in this article is raised by the School of Telecommunications Engineering of Valencia in 2013 and proposes the introduction of MPLS in the trunk network of access transmission since all types of traffic can be trans- ported between they because they support ATM, IP and TDM links. This is done by means of an emulated circuit indicator header and a system for transferring the clock signal based on RTP (Real-Time Transport Protocol).

PROPOSAL

In one study, three types of algorithms were analyzed in a passive entry of four types: live transmission and storage, within which two others were carried out: transmission under normal conditions and in high network traffic conditions.

The first test was done with a live transmission and saved, which show no alteration in the implementation of the algorithms.

The second test was carried out to check the adaptability of the frequency in which it was evidenced that the algorithms based on buffer have the best performance, that is, the BBA and BOLA algorithms.

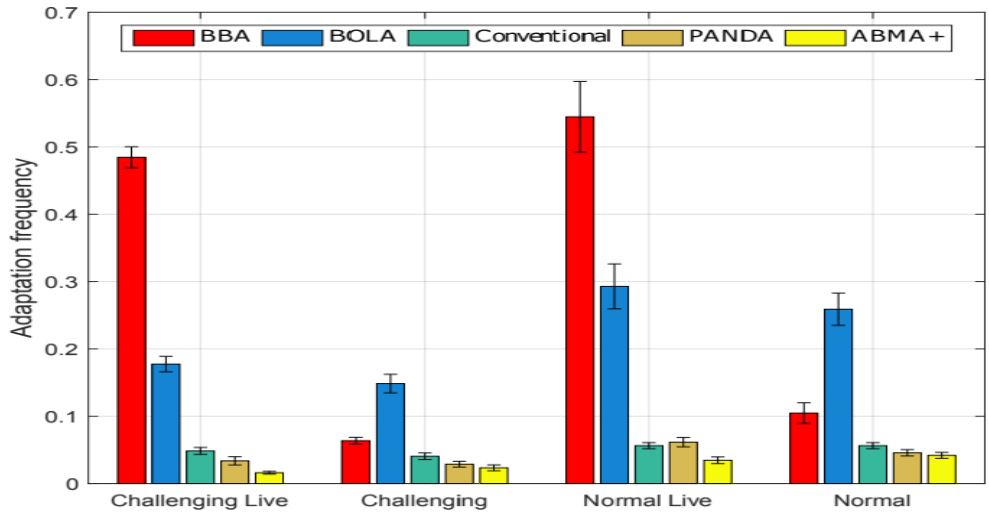

Figure 3: Transmission live From [11]

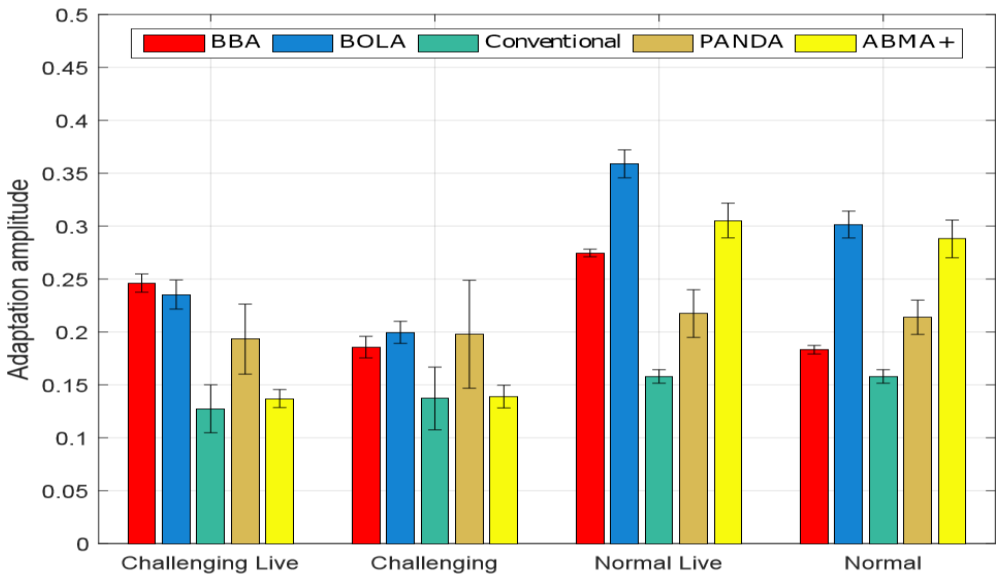

Figure 4: Transmission live From [11]

From this analysis, it is obtained as a result that the adaptation algorithm from the segment in which it is started does not affect the behavior of the output.

RESULTS

The algorithms of adaptation based on class buffer presented the best performance. From these findings, we can conclude that the best adaptation values are also presented by the BBA and BOLA algorithms.

The critical points in the network are presented in the queue, especially in the interval and the threshold of this. For the flow of the types of service (Video, audio, photo, etc.) to increase and not find obstruction during transport the routers and switches must have a differential behavior these. The MPLS allow the transport of all types of traffic, which facilitates the reproduction and consumption of the users of the different types of ser- vices

Most of the proposed solutions propose that the best option is based on the division of information into packages and then prioritize it so that transportation does not be- come obstructed and therefore the reproduction is fluid.

CONCLUSIONES

Buffet-based algorithms present the main performance parameters of adaptability and stability, especially for small buffers, which are the most common transmission environments.

It is expected that the HTTP protocols, taking the configurations in the receiver, a case study, however, given the algorithms shown below, improve performance if you implement a BBA or BOLA algorithm.

The CODEL technique decreases the packets in the time interval that does not have enough points of arrival in the wireless access links.

fcCODEL controls TCP congestion by delegating each subqueue (subqueals exist because the queue was previously divided into 1024 parts) a new stream.

The QoS admit that the width of the band is not consumed among the different actors of the network and in this way the flows are prioritized so that the important ones are transported first and this allows that there are no obstructions in the flow of the different applications .

MPLS support ATM, IP and TDM links, which means that they transport all types of traffic through an emulated circuit indicator header and a system to move the clock signal based on RTP (Real-Time Transport Protocol).

It can be concluded that the algorithms buffer-based, present the major performance parameters of adaptability and stability especially for small buffers, which are the most common streaming environments.

Protocols of HTTP, taking the settings on receiver-driven, a case of studio, however given the algorithms shown subsequently showed, is expected to improve performance if you implement an algorithm BBA or BOLA

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