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Load Balancing For Video Streaming In Multiple Access Networks

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***Abstract*—** **Now a day'svideo streaming is most popular application in wireless networks. Devices like smart phones, laptops, and tablets are connected with multiple network interfaces. Since the smart phone devices have less storage capacity and energy supply it is very challenging to provide high quality video streaming services in wireless networks. It is a promising trend to use multiple wirelessnetwork interfaces with different wireless communicationtechniques.Utilizing the multiple links efficiently and effectively,it is required to provide quality of service for video streaming. Real time adaptive algorithm [1] provides such quality for video streaming. This algorithm downloads the video data into multiple networks at different data rates. These data rates are not constant. It causes the more delay for some network links.**

The proposed system overcomes the limitations by maintaining the constant load for all network links. The effectiveness of the proposed system is evaluated using ns2 simulator.

INDEX TERMS- Multiple links, load balancing, video streaming.

I. INTRODUCTION

Video streaming is gaining popularity in mobile applications.The wireless channels will make too much of changes, it is very special contest to produce good quality for video streaming. Wireless connections procedure for mobile devices was declaring aim to service multiple wireless networks. For example cell phone connecting to Wi-Fi and Bluetooth networks. The mobile devices can be connected to multiple connections results better performance for video streaming. Let assume high reaching bandwidth can post video in high bit rate. At the same time one wireless link is faileddue to poor link conditions or congestion. To affect likewise disadvantages of advance download dynamic adaptive streaming over http (DASH) [2] has been recommended.

DASH system stored a data with different resolution and quality of pre-compressed videos in segments. The client side made decisions of rate reformation. This pull based DASH program increases to post multiple links. In this paper, develop the load balancing in multi-link video streaming process as a reinforcement study work. One by one streaming step we explain a state to define the present situation the index of the communicationsegment the present expect bandwidth whatever system parameters. A finite state MDP can copy assistance study task.

Dynamic adaptive streaming over HTTP is an important topic in present days. The DASH provided into most popular products like apple HTTP live streaming and Microsoft smooth streaming. The users can accept different expected bandwidth as well as display size.Each video file can encode into number of times. The video filesare stored into different levels of quality,resolution and bit rate. A total encoded video file's fell in to particular small segments as well as stored on the web server. The client was downloaded available small segments and that can play.

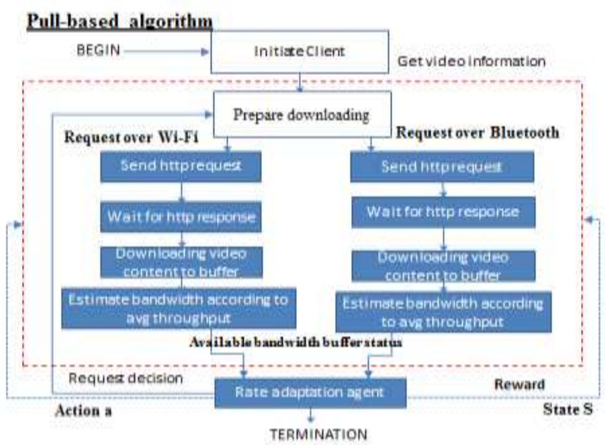
A. Related work:

The initiation considered to quality contribution as well as decoding time of particular segment using to determine bandwidth in a statistical method. K.P Mok et al, represents a QOE aware DASH system [8]. Their algorithm evaluation of present bandwidth by probing for video data, maintain the quality as smooth as possible and buffer level being a stable. [10] S. Akhshabi designed and performance methods, totest the performance of a number of exiting exchange DASH products. There are Netflix, Smooth Streaming and OSMF [5]. T.Kupka evaluates the performance of present live DASH under off/on traffic signal is tested different methods that are implementing the performance. Reducing the waste video quality modifications used to probing method to know the particular bandwidth was given. [3][4]The initial streaming SVC over HTTP using Markov decision process, authors implemented the optimal rate adaptation algorithm. These procedures only consider for single link connections, we can study contend the case with multiple access network links. [9] Kaspar et al, implemented a algorithm into DASH over multiple links, in the algorithmevery segment designed to transfer at the same time[11]. The multiple segments can transmitted in the same time. In they have one problem that is last segment problem due to the multiple link transmission speed difference. [12]-[14] Evensen method of solving particular disadvantage to divide every segment in small-small sub-segments and download the particular small sub segments into multiple links. This algorithm can evaluate the present bandwidth depends on the throughput of the previous last segment.The selected video quality level can evaluate the bandwidth. [1]Min Xing was implemented real time adaptive algorithm for multiple links to perform the good quality video streaming and evaluation of bandwidth.

B. System model

Multiple wireless connectionsare used to preform stablevideostreaming. E.g. Using Wi-Fi and Bluetooth connections are using similarly into the mobiles. Wi-Fi and Bluetooth connections are considering as we don't haveend to end control over mobilelinks. The real time adaptive method we are using two different wireless links into the wireless devices. The wireless links are broken into time varying, shadowing, fading, congestion and interference.The present bandwidth of wireless connection may suffer all the timedepending upon storage size of the particular device. The server will be stored in number of video copies in different level. The videos will be encoded as SCV into several enhancement layers and base layer, and video files are chopped into segments, that segments weather played with fixed time.

The pull based algorithm for video streaming is as follows: Step1.Initialization of the client was request to the video file which includes quality, bit rate and video resolution in to server. Server accepts both Bluetooth and Wi-Fi connections. To download the video segments the user sends a request into both Bluetooth and Wi-Fi though the HTTP requests. This will be continuing until complete download of last segment on the downloading file or transformation file. The particular video can play into the video streaming application such decision are taken by the users.



II. EVALUATION OF STREAMING PROCESS

The video streaming process was considered interaction between two nodes. The process sends a state signal on the each video segment into agent then it will be considering the best action. The Markov process wants to derive the reward functions in state transition model, the MDP property of the system state that can be formulated by streaming process [19]. We consider n steps in filethe download segment n, the number of total steps evaluating the number of segments. In each step we determine the state as[15]

$$S_n=\{q_n,\Delta q_n,v_n,\Delta v_n,t_n,\Delta t_n,bw_n,bt_n,d_n\}$$

The parameters will be determined as follows:$q_n$represents number of an unplayed queue segment also called as buffer queue length. The larger SVC video levels total will be represented as high quality layer. Δq_n and $\Delta v_n$are represents as quality and variations of q_n and $u_n$that is $\Delta q_n=q_n-q_{n-1}$and $\Delta v_n=v_n-v_{n-1.}$ The traffic details of total Bluetooth connection downloaded and the previous segments is recorded into $t_n$and $\Delta t_n=t_n-t_{n-1.}$ The bandwidth states of Bluetooth and Wi-Fi links are determined as $bw_n$and bt_n. $d_n$which indicates the present requested segment index, the total number of video segments an $N_{T,}$ $d_n$in the limitations of $[0,N_t]$.

The environmental action of decision to receive the input of state s_n. So we define four types of actions $A_{w,}A_{b,}$ $A_{v,}A_{s.}$ The quality is determined in u. The variation of A_u and$A_b$is $A_{b.}$ It downloads both Wi-Fi and Bluetooth linksin similar way. A_v will be used by Wi-Fi link usage. A_b determines the download base on the present available bandwidth. The available bandwidth of Bluetooth and Wi-Fi are b_w and b_t, and the segment size S_z. The downloading segments through Wi-Fi size is $S_z{}^{.}bw/(bw+bt)$.A_w represents the time of waiting action for W seconds in the client. The quality and smoothnessare represented as smooth action. The smooth action performs following three principles. The queue length is low; the smooth action was not taken as in high probability to shows playback freeze. The smooth action will be involved only when the queue length is larger than a particular threshold T_s. The segment will play before than smooth action for the requested video layers and may miss the playback deadline.

The Markov channel models are useful to estimate the rate of adaptation in statistics of bandwidth which accurse in variations of wireless links. In different time finite-state Markov models describe the present bandwidth of the Bluetooth and Wi-Fi using history data. The Markov property can be, the state at initial time depends on its previous state. [15]That gives any state S and action a the particular transition probability of MDP is evaluates

$$P^a_{ss'}=pr\{s_{n+1}=s'|s_n=s,a_n=a\}.$$

The transaction probability of independent wireless links can be calculated as[16]

$$P^a_{ss'}=pr\{bw'|bw\}.pr\{bt'|bt\}.$$

In order to estimate actions which are how good, determine a reward value r of each action. The reward value$r_n=R(s_{n-1})$ at the step n is determined previous state $S_{n-1.}$A positive reward is more fetched so that actions are acceptable. The negative reward of the larger magnitude is given with q in less form threshold T_{qmin} the video playback will freeze. The smooth and high quality video streaming is gives negative rewards due to high fluctuations. According to that determined a cost function of Wi-Fi Cw(x) which is constant traffic load. Bluetooth is used a constant plus a liner functions [17].

$$C_w(x)=R_{w,}$$
$$C_t(x)= K_t+R_tx.$$

The cost function of the mobile data plan is similar to Bluetooth. When we use additional cap Kt, the additional data will be changed to high rate. The streaming policy ∏ of all possible actions can be mapped. The optimal strategy policy ∏ can expect high long-term reward $V^{\Pi}(s)$ of as video streaming for multiple links.[17]That multiple link video streaming can be finally formulated as a optimization problem:

$$\Pi^{*}(s)=\arg\max_{\Pi}\sum_{s'} P^{a}_{ss'}[R^{a}(s)+\gamma V^{*}(s)].$$

A. Bandwidth Estimation

The transformation network loads will be changed and fast outages are difficult to estimate, the result of available bandwidth for session becomes a time-varying random process. In the former homogeneous Markov chain is used to estimate the available bandwidth and our work is heterogeneous and time varying Markov model using to estimate the future bandwidth. Assume that there is an n state matrix, i.e., an n×n transition matrix is p and it will be usedto estimate the Markov channel model. The segment gets complete by downloaded; then the transition bandwidth will be calculated by dividing the total size of the data transmits over the total transmission time. The bandwidth will be determines and we can implement the Cij by one Pij will be updated by depending on equation:

$$P_{ij}=\frac{\text{Cij}+1}{\sum_{j=1}^{n}\text{Cij}+n}$$

And each element of $P_{ij}$is transitioned probability from the states i to j. C is usedfor counting the number of transitions each node.

B. Real Time Search Algorithm

Depending on the video streaming process the formulation is the best long-term reward and the stateS and action A are as follows:

$$Q^{*}(S,A)= R(s)+ \gamma\sum_{s'} p^{A}_{ss} V^{*}(s'),$$

Here V*(s') is the best term rewarded for s', all the available feature steps for obtaining the optimal solutions by using dynamic programming, Which results in extreme long computation time. The sub-optimal solutions are defined as based on this idea; we develop a real time recursive best action search algorithm. An improved issue of reducing the search time for the each state for an acceptable value.

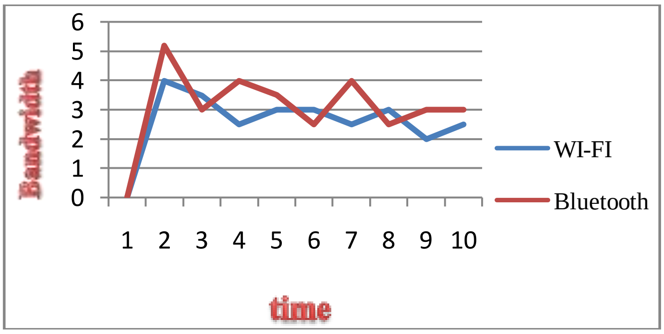


Figure 1 Real time connecting in networks

C. Discussion

Depending on the MDP which can be implemented as viewed decision tree. The present states are considered on the root state of the feature possible actions and states of the nodes and leaves form the decision tree. The recursive search will be continued until we reach the next state. The depth-first algorithm is a real-time algorithm.In the real-time algorithm they can find the computational complexity as $O(b^{D})$, here b is total number of branches in a tree and D is the search depth. The search depth is equal to total video segments in a state Nt, it will exactly represents to the dynamic programming algorithm. In stack, there is no need to store the all segments why because the memory consumption which had occurredin recursive search algorithm is not high.

III. PROPOSED WORK

A smart phone with android OS is used as the client. The particular smart phones are interconnecting with Wi-Fi, 3G and Bluetooth of wireless connections. As 3G and Wi-Fi will not work at the same time in the android OS, Bluetooth and Wi-Fi which are activated to synchronised to transfer the video segments similarly to check the involved multi-link streaming result. A video streaming application is requested the video contents from web server through HTTP/1.1 protocol. The application of video streaming contains three components: the streaming process perform search module, Bluetooth connection module, Wi-Fi connection management module. The number of requests to accept and begin, the video streaming process will be take decision by the number of layers in every connection. Once decision was taken to Wi-Fi and Bluetooth modules send HTTP/1.1 requests of the web server start download the particular video segments. The downloading will continue until the last segment. In android OS there is no SVC decoder, the users are request to the video segments and stored the carrying trace. By using PC to evaluate the decode experiment results.

The video files are stored and list, the total number of segments and duration of the segment in a list. Thetotal no of layers and corresponding resolutions are simple and manifest into evaluation. The Bluetooth is not connected directly client to the web server, we implement Bluecova java Bluetooth library proxy on the laptop. Client sends request form HTTP/1.1 to proxy will be forward to the request to the web server which downloads the video segments from the server and send the downloading segments to the users.

In order to maintain load balancing on multiple access networks,theproposed algorithm for video streaming in real time adaptive in multiple networks. The clients are using in android OS in our smart phones. That smart phones are connected with Wi-Fi, Bluetooth and 3G wireless connections.

Figure 2 Network Topology

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IV. LOAD BALANCING IN MULTIPLE ACCESS NETWORKS

Load balancing was involved when two or more networks connections are connected to use the load balancing router. Load balancing was produces increases speed by maintaining the internet connections of multiple access networks.

A. *Load Balancing Algorithm:*

- Initialize action ***A***
- Initialize state ***S***
- Initialize links ***L***
- Initialize load of link ***load***
- Initialize threshold ***t***
- **Update States in Markov Model**
- For each state ***s*** in ***S***
- Analyze bandwidth of links
- Update ***s***
- End For
- **Load Balancing**
- For each state ***s*** in ***S***
- For each action ***a*** in ***A***
- For each link ***l*** in ***L***
- compute ***load*** of ***l***
- IF load <***t*** THEN
- Send data through ***l***
- ELSE
- Consider alternative link
- End For
- End For
- End For

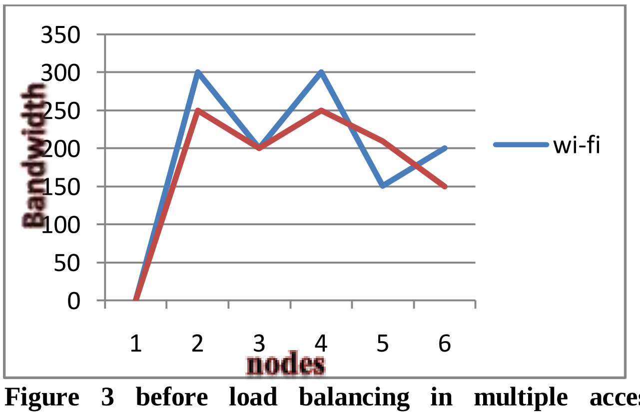

Figure 3 before load balancing in multiple access networks

Using internet applications to provide the better experience delivery for two are more networks are access network in load balancing. Load balancing routers are not banding multiple internet connection stable line ADSC banding. Load balancing router connected to a multiple access lines at the same time balancing the load. Load balancing routers can provide to share the presses network connection between multiple users and devices. Example: if we have two devices connecting to simultaneously view separate 1.5 mbps I player streaming a load balancing router was provided route i.e I player traffic for the first user along the first HTTP streaming connation second user the number of users connected to the router better job for balancing a traffic . That contains high processing power and adds new feature algorithms.

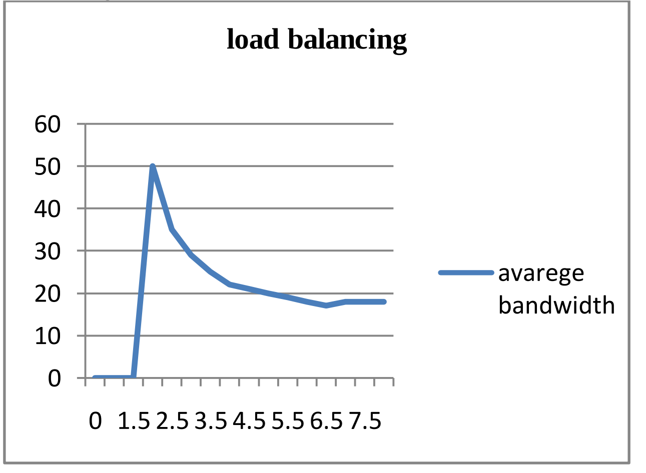

Figure 4 average load in Wi-Fi and Bluetooth

Since the state transaction probability matrix in the proposed algorithm can reflect the bandwidth variations, the results outperform with the measured throughput, we still can achieve a better performance.

V. CONCLUSION

This paper proposes a load balancing algorithm for video streaming over multiple wireless networks. The proposed algorithm can achieve a better load balancing in multiple access networks,by improving the bandwidth utilization.The proposed system overcomes the limitations of the existing system by better allocation of the loads between several links with finer granularity.

The proposed work can be used for minimum number of devices in the networks. In future to improve performance, more number of devices can be used in the networks. Here constant bit rate(CBR)is used as video segment size. In future, other bit rates can be considered.

VI. REFERENCES

1.Min Xing “A Real-Time Adaptive Algorithm for Video Streaming over Multiple Wireless Access Networks”,Student Member, IEEE,SiyuanXiang,Member, IEEE,and Lin Cai,Senior Member, IEEE

2.T. Stockhammer, “Dynamic adaptive streaming over HTTP –: standards and design principles,” in *ACM MMSys’11*, 2011, pp. 133–144.

3.S. Xiang, L. Cai, and J. Pan, “Adaptive scalable video streaming in wireless networks,” in *ACM MMSys’12*, 2012, pp. 167–172.

4.S. Xiang, “Scalable Video Transmission over Wireless Networks,” Ph.D. dissertation, University of Victoria, 2013

5.T. Kupka, P. Halvorsen, and C. Griwodz, “Performance of on-off trafficstemming from live adaptive segmented HTTP video streaming,”IEEE LCN’12, 2012, pp. 401–409

6. M. Xing, S. Xiang, and L. Cai, “Rate adaptation for video streamingover multiple wireless access networks,” in IEEE Globecom ’12, 2012,pp.5745-5750
7. K. Tappayuthpijarn, T. Stockhammer, and E. Steinbach, “HTTP-based scalable video streaming over mobile networks,” inIEEE ICIP’11, 2011, pp. 2193–2196.
8. R. Mok, X. Luo, E. Chan, and R. Chang, “QDASH: a QoE-aware DASH system,” inACM MMSys’12, 2012, pp. 11–22
9. L. Cai, S. Xiang, Y. Luo, and J. Pan, “Scalable modulation for video transmission in wireless networks,” *IEEE Trans. Veh. Technol.*, vol. 60,no. 9, pp. 4314–23, 2011.
10. Akhshabi, S. Narayanaswamy, A. C. Begen, and C. Dovrolis, “An experimental evaluation of rate-adaptive video players over HTTP,”Signal Processing: Image Communication, vol. 27, no. 4, pp. 271–287,2012.
11. D. Kaspar, K. Evensen, P. Engelstad, and A. Hansen, “Using HTTP pipelining to improve progressive download over multiple heterogeneous interfaces,” in *IEEE ICC’10*, 2010, pp. 1–5.
12. K. Evensen, T. Kupka, D. Kaspar, P. Halvorsen, and C. Griwodz,“Quality-adaptive scheduling for live streaming over multiple accessnetworks,” in *ACM NOSSDAV’10*, 2010, pp. 21–26.
13. K. Evensen, D. Kaspar, C. Griwodz, P. Halvorsen, A. Hansen, and P. Engelstad, “Improving the performance of quality-adaptive videostreaming over multiple heterogeneous access networks,” in *ACM MMSys’11*, 2011, pp. 57–69.
14. K. Evensen, D. Kaspar, C. Griwodz, P. Halvorsen, A. F. Hansen, and P. Engelstad, “Using bandwidth aggregation to improve the performance of quality-adaptive streaming,” *Signal Processing: Image Communication*, vol. 27, no. 4, pp. 312–328, 2012.
15. H. Wang and N. Moayeri, “Finite-state Markov channel-a useful model for radio communication channels,” *IEEE Trans. Veh. Technol.*, vol. 44,no. 1, pp. 163–171, 1995.
16. Q. Zhang and S. A. Kassam, “Finite-state Markov model for Rayleigh fading channels,” *IEEE Trans. Commun.*, vol. 47, no. 11, pp. 1688–1692,1999.
17. X. Hou, P. Deshpande, and S. Das, “Moving bits from 3G to metroscaleWiFi for vehicular network access: An integrated transport layersolution,” in *IEEE ICNP’11*, 2011, pp. 353 –362.

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