Volume 2, Issue 6, June 2012 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Optimizing delay in Peer to Peer Live Video Streaming

Urvashi Rao[*], T.P.Sharma
CSED,NIT,Hamirpur
India
urvashirao.87@gmail.com

Abstract— **Peer to Peer Live Video Streaming has become the most popular application over the Internet. But, quality of Live Video Streaming is still far off from being totally satisfactory. A lot of improvements are proposed to improve quality of video and reduce different kinds of delays in the network. The main cause of delays is the autonomous nature of Internet. In this paper an algorithm has been proposed for reducing the mesh delay between peers.**

Keywords— **Peer to Peer, video streaming, mesh based peer to peer,peer delay**

I. INTRODUCTION

Streaming media is media that is constantly received by and presented to an end-user while being delivered by a streaming source. Live streaming, more specifically, means broadcasting generated media live over Internet. The process involves a camera for the media, an encoder to digitize the content, a media publisher where the streams are made available to potential end-users and a content to distribute and deliver the streams. The media can then be viewed by end-users live.

II. VIDEO STREAMING

Live video streaming is perhaps the greatest unfulfilled promise of the Internet. There have been tremendous efforts in the design and experimentation of video streaming systems in the past two decades. There has been no shortage of technical innovations, yet no single system has delivered the desired scale and quality of service.P2P-based streaming technology brings unprecedented new momentum to Internet video streaming, which has been shown to be cost-effective, scalable, and easy to deploy. Although such approach is very attractive, however, currently provided services could not satisfy all users' Quality of Experience (QoE). Suppose in a small group, when all users watching a live TV program, such as a live soccer game, some peers might saw a goal minutes after other peers. Longer latency among peers would reduce user's interests and causes their dissatisfactions. There are two types of video streaming services

A. Live Video Streaming

Live streaming provides video streams to be transmitted in real time to all requesting clients. One or more users have their playbacks synchronized with their stored content to provide it to other peers.

B. Video on demand

Video on demand provides video streams to be transmitted in non real time to all requesting clients. on demand streaming is used for pre-recorded content and allows asynchronous playback, where different viewers may watch different parts of the same archived media file

III. QUALITY OF SERVICE

The quality of service (QoS) of a streaming system refers to the quality of experience (QoE) of end-users. These are the terms for end user experience; smoothness of the display, the frequency, and the startup latency. For example, users can't tolerate longer delay.

Streaming system (video on-demand like movie watching) is very obvious. In a live two-way audio conferencing system the delay can vary up to milliseconds. The P2P system uses distributed topology, which introduces few challenges and these are less relevant for a centralized system, so by introducing the optimal topology we can reduce the delay. The delay among peers in peer to peer live video streaming can be reduced by the previously proposed novel scheme. This algorithm needs the complete knowledge of the network which is not possible to retrieve in reality the result of this scheme shows that distributed scheme is closed to centralized one. The playback delays among peers should be reduced by the centralized algorithm. For Example live soccer game, some peers might saw a goal minutes after a while , this is due to playback lags between peers. There are mainly two type of delays; overlay delay (in units) between two peers and time delay (in units). These delays have been reduced (units) by the centralized algorithm and distributed algorithm. Rest of the paper is organized as follows section IV contains the proposed scheme and algorithm, next in Section V results are shown through graphs and Section VI concluded the whole paper.

IV. PROPOSED SCHEME

An example of mesh-based live streaming system is shown in Fig.1. S is the streaming source, and A, B, C, D, E are several peers in the steaming session. The number on the arrows is the overlay/link delay (in units) between two peers. The number next to each peer is the time delay (in units) from S, which is the sum delay along the farthest path from S to that peer

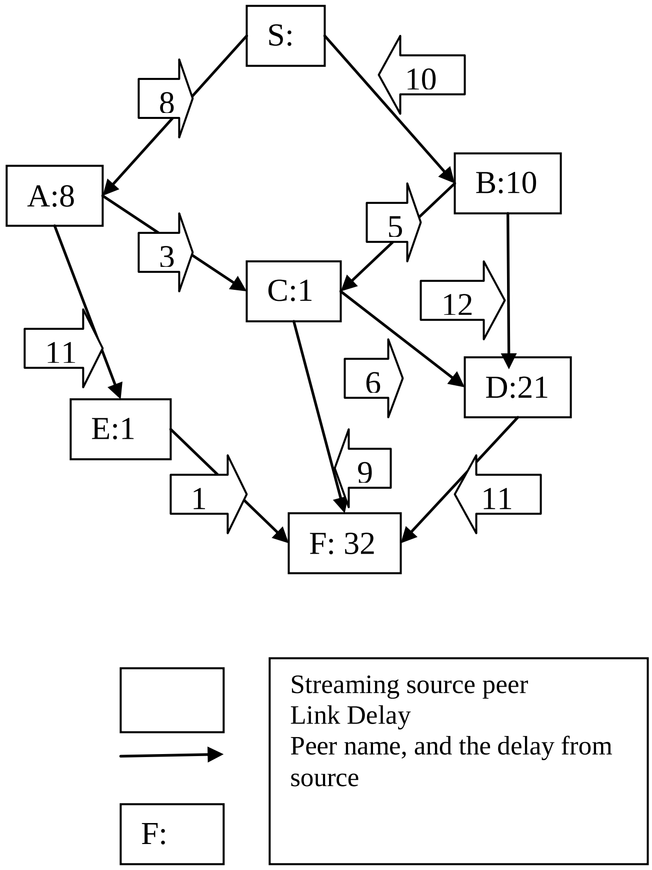


Figure 1 Playback lags among peers

In the mesh-based P2P streaming system, the total delay among peers comprises of two components: network link delay and the packet schedule delay. To improve live streaming peer-delay systematically, we focus on minimizing network link delay. This is the major delay part in the overall delay from source to peer. The main focus is on how to minimize delay among a small group of peers. Reducing delay among all peers in overlay network is not necessary and is costly, we choose to minimum delay among a small group (i.e., no more than 5% of the total peers).

Synchronization Group: Small group could be some nearby friends watching the same channel, or a group of virtual society members watching the same program with other real-time communication sessions, such as instant messaging, or phone call, talking about the program while watching. such a group defined as Synchronization Group.

Problem : The P2P overlay network can be considered as a complete directed graph G= (V, E), where V is the vertices set including peers in the network, and E=V*V is the set of overlay edges. $T' \in$ G, which represents current, overlay topology. For any edge from peer i to j < i, j>, the cost of edges is sum of delay and the underlay path node i to node j. in the physical network the ISP provides the streaming rate, uploading bandwidth .The synchronization group which contains peers that need to reduce delay among them is presented as Vs, with Vs $\in$V. ISP sets a fixed priority for all the peers and on the basis of priority we apply Quick sort in synchronization group Vs. Now keep the sorted Vs in Vsort.

Priority is prefixed and stored at streaming source i.e. py [i=1 to N (is number of peers)].

dij represents the delay between i and j. hi as the delay of node i along the overlay path from content source, which is the maximum of the delays of node i's parents plus the connection delay between i and its parent. hi = $max_{j:j\in P_i}\left(h_j + d_{ij}\right)$ and here Pi is the set of parents of peer i.Each peer can provide ui total uploading bandwidth to upload multimedia data to other peers. ri is remaining uploading bandwidth out of ui , and we have ri <= ui.

To find a optimum topology which can provide minimum delay among peers in Vsort. So we need a algorithm to find a optimum topology $T_{optimum}$, to get the optimum value of

Algorithm

Having complete knowledge of the overlay network, a centralized algorithm could provide a topology to optimize equation (i). This complete knowledge include current topology, total uploading and remaining uploading bandwidth of each peer, priority of each peer, each peer's parents and children, and all overlay link delay between any two peers.

Consider each peer in Vsort as the target peer i one by one.

While choosing the target peer i,consider py where y=1to N apply quick sort in Vs and keep in Vsort

Each time set a target peer, all other peer j in Vsort try to find suitable parents k to make its own hi have a minimum difference τij with htar .

For each peer j in Vsort, we sort k according to τji in ascending order.

Each peer j try to connect to a parent k which can keep j's playing position is closest to target peer i. But if, parent k may not have sufficient remaining uploading bandwidth for peer j. So peer j has to find more parents to fill its downloading bandwidth up to streaming rate s.

And this of course would cause τ_{ij} have to be a bigger value. After all peers in Vsort is considered as the target peer, and we have the optimum $\tau_{optimum}$. The topology which has $\tau_{optimum}$ is the optimum topology. The algorithm ends when the optimum topology is found.

PSEUDO CODE OF CENTRALIZED ALGORITHM2 WITH PRIORITY

Input
G= (V, E)
Streaming rate: s
Source node: S
Delay: d_{ij} for i,j $\in$ V
Priority: p_y [i=1 to N (is number of peers)]
Algorithm
1. $\tau_{opt} = +\infty$
2. V_{sort}= sort V_s [Applying Quick Sort using p_y for each peer]
3. $V_s = V_{sort}$
4. For each i$\in V_{sort}$ // set target in Synchronization Group
5. $V_{tar} = i$
6. $h_{tar} = h_i$
7. Delete all peers in V_{sort} except peer i
8. Initial s_j for all j$\in V_{sort}$
9. Re-calculate upload bandwidth for all i$\in$V
10. For each j$\in V_{sort}$ and $j \neq i$
11. T_{tmp}= T'-(V_{sort}-i)
12. For each k $\in T_{tmp}$
13. $\tau_{jk} = | h_{sk}+h_{kj}-h_{tar}|$
14. Sort k according to τ_{jk} in ascending order
15. k= 0
16. while s_j<s
17. if r_k>= s - s_j
18. $r_k=r_k-(s-s_j)$
19. s_j=s
20. $h_j=h_s+d_{sk}+d_{kj}$
21. PUSH j into T_{tmp}
22. Else
22. $s_j = s_j - r_k$
23. $r_k = 0$
24. k =k+1
25. if $\tau_{opt} \geq \max_{j\in V_{sort} \& j\neq i}|h_j - h_{tar}|$
26. $\tau_{opt} = \max_{j\in V_{sort} \& j\neq i}|h_j - h_{tar}|$
27. $T_{optimum} = T_{tmp}$
28. Return $T_{optimum}$

Distributed Algorithm 2:
As explained above in centralized algorithm 2 the complete knowledge of whole network is not possible in realistic terms. So the particular algorithm is taken for the comparison with others. because we can't keep any central server to keep data about all the peers , the link information, the priority values of all the peers.
Each peer keeps some information on the basis of TTL (time to live) messages. In synchronization group the peer communicates with each other and checks the playing position of each other i.e. based on frame information of video stream and the priority of each peer. That particular information gives the difference between peers playback time with each other and the average set value of one group. also checks that which has higher priority than other. After this, the parent selection algorithm runs to find appropriate parent so that the difference between peers playback times can reduce. Now check the remaining bandwidth is enough to provide the streaming rate. if not then by RTT(round trip time) value and priority value we choose its nearest parents and calculate that which can be the parent with minimum delay between the playing positions.

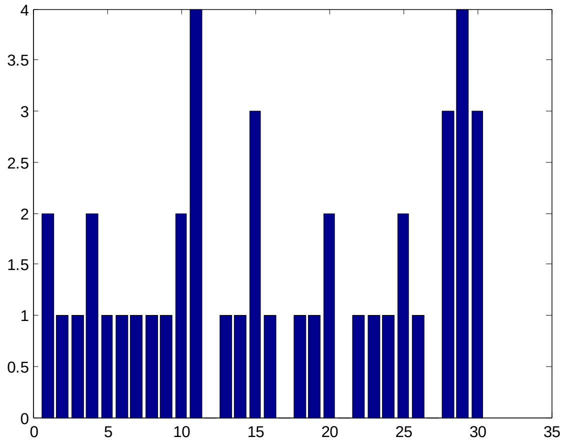
When all the peers in the synchronization group find their parents the total delay in the group reduced but the groups are dynamic in nature so we need to apply the algorithm several times to get the minimum delay.
On the basis of fixed topology, we randomly select 3 to 20 peers to minimum delays among them. Then calculate delays according to following equation.

$$\min \sum_{i\in Vsort}^{N} \sum_{j\in Vsort}^{N} |h_i - h_j| * 1/N^2 \quad ....A$$

this equation provides the minimum optimum delay of peers.

V. RESULTS

In the simulation we use Matlab R2008. Initially we consider only 30 peers and delay is accordingly calculated by equation A (as in above)



VI. CONCLUSION

Priority is the additional factor used in centralized algorithm as well as distributed algorithm[1][2]. by this factor if certain users of particular group seeking for the same data and in another group only one or few seeking for the same so then its better to stream data on the basis of priority assigned by Internet service provider and demand of the users.

VII. REFERENCES

1. Gu Qiang, Xia Yehan, Zou Hua, Yang Fangchun, *A novel scheme to reduce among-peer delay for peer-to-peer live streaming,* Proceedings of IC-BNMT2009

2. Dongni Ren Y.-T. Hillman Li S.-H. Gary Chan, *On Reducing Mesh Delay for Peer-to-Peer Live Streaming* 978-1-4244-2026-1/08 2008 IEEE

3. Hatem Bettahar,Tutorial on Multicast Video Streaming Techniques, SETIT2005

4. *J. Liu, S. Rao, B. Li, and H. Zhang, Opportunities and challenges of P2P internet broadcast,* Jan. 2008

5. Susu Xie, Bo Li,,Gabriel Y. Keung, and Xinyan Zhang, *CoolStreaming: Design, Theory, and Practice* IEEE transactions on multimedia, vol. 9, no. 8, december 2007

