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P2P VIDEO STREAMING OVER OPTIMAL DISTRIBUTION TREE ADAPTING MULTIPLE DESCRIPTION CODING

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Abstract--In this paper,we propose a p2p video streaming system implemented over an optimal distribution tree constructed with "Preferential Attachment Model principle" in which node with high utility is give more priority.Optimal distribution tree overlay results in minimum delay solution, which is then adapted with Multiple Description Coding [MDC]. MDC is an integral part of our solution. By splitting the video stream into smaller streams ,we can utilize all the bandwidth of a peer. MDC sustain the better quality of video while streaming. Multiple streams allow more efficient adaptation of the optimal distribution tree to current network conditions. And our analysis suggests that the proposed solution has better delayperformance, better video quality and more robust than existing tree-based streaming solutions.

Keywords-- MDC, Optimal Distribution tree, Peer-to-peer, Video Streaming.

I. INTRODUCTION

Peer-to-Peer (P2P) networks is a developing trend to support video streaming e.g., video conferencing applications, which don't require a proper infrastructure.P2p technology made advancements in multimedia applications, where video services such as Internet Protocol Television (IPTV), Internet TV, video sharing, and video podcast have gained significant popularity. The recent explosive growth of such p2p systems is due to two main reasons. First, the low cost and high availability of large numbers of computing and storage resources.Second, increased network connectivity.

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As these trends continue, the P2P network system is bound to become morepopular. Unlike traditional distributed systems,
P2P networks aim to aggregate large numbers of computers that canjoin and leave the network frequently and that might not have permanent network (IP) addresses.

In P2P systems,individual computers communicate directly with each other and share information and resources without using dedicated servers. Major challenges in p2p media streaming system are longer video startup delays, namely the lag between a video object is chosen by a user and the actual playback starts on his/her screen and poor video quality.

we concentrates with delay constraints and derive the minimum delay bounds for real time P2P streaming systems adapting Multiple Description video coding to sustain the same video quality. The two main overlay topologies in p2p video streaming system are tree-based topology and mesh-based topology**.** Another network model called Hybrid System overlaycombines the tree based push and mesh based pull. This paper uses Tree based works with Preferential Attachment Model principle ["Optimal" distribution tree]with the packet level, it is used for its high performance even if the stability of peers are dynamic, low maintenance and peer bandwidth contribution is optimum. As the packets are transmitted over long, unreliable multi-peer transmission paths, it is particularly challenging to achieve consistently high video quality and low end-to-end delay. Our results showed a consistent gains when systems are designed to adapting Optimal distribution tree for minimum delay bound in real timeP2P video streaming with encoding structure Multiple Description video coding of the video streams while transmitting, Which results in a low-latency system.

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II. RELATED WORK

A.Experiments inNetwork Overlaying:

For past few years, several solutions based on the peer-to-peer (P2P) paradigm haveemerged to address large-scale video streaming. Such solutions can be classified roughly into tree-based systems or mesh-based systems. In tree-based systems, peers are organized into a tree structure and information (i.e., video stream) flows down one or more distribution trees. In mesh-based systems, there is no particular structure and peers exchange information directly with one another, dynamically changing their neighbors over time, similar to an epidemic dissemination.

B.Experiments inVideo Coding Techniques:

Video delivery is a very active working area in the research community and several video coding techniques have been investigated. In this context, scalable video coding and multiple description coding are well established and widely studied concepts. These techniques are often proposed in video streaming systems to gain robustness during a transmission. MDC has emerged as a promising scheme to enhance the error resilience of a video delivery system. A comparative study of MDC and SVC for a wide range of scenarios using network simulations is presented.

III. PROPOSED SYSTEM ARCHITECTURE

The proposed p2p video streaming system uses an optimal distribution treeadapting Multiple Description video coding to sustain better video quality. We model the construction of the distribution tree using a simple probabilistic growth process that considers node degree and node distance. Our generative model is based on the idea of "preferentialattachment" where preference is given to nodes with higher utility, which is a measure for the quality of the video served by a given node in the tree. Our model has a single parameter that captures the relative importance of node degree and node distance when assessing the video quality.Multiple Description video coding is a technique generates two or more data streams containing descriptions of the source. Each description can be decoded independently of the others to provide baseline quality. However, the decoded videos from the different descriptions can be combined in order to provide a higher quality video. The descriptions can be individually packeted and sent from the source node to the receiver node through either the same or separate physical channelsor paths.

A. Network overlay topology

The two main overlay topologies in p2p video streaming system are tree-based topology and mesh-based topology. Tree structure overlay, a conventional tree overlay can be either singletree or Multi. In a single-tree based approach, peers are arranged into a treerooted at the server. Each peer receives the stream from its parent peer and forward to its children peers. The fan-out degree of a peer is limited by its uploading bandwidth. An early example is Overcast One major drawback of single-tree approach is that all the leaf nodes don't contribute their uploading bandwidth. They account for a large ratio of peers in the system. This largely degrades the peer bandwidth utilization efficiency. In multi-tree overlay streaming, the server divides the stream into m sub-streams. Instead of one streaming tree, m sub-trees are formed, one for each sub-stream.

In a balanced distributed-tree streaming, the node degree of each sub-tree is m. Each peer joins all sub-trees to retrieve sub-streams. Any peer is positioned on an internal node in only one sub-tree and only uploads one sub-stream to its m children peers in that tree. In each of the remaining m − 1 sub-trees, the peer is positioned on a leaf node and downloads a sub-stream from its parent peer. In mesh based system lacks in efficiency and latency. Mesh based structure are more reliable for its dynamic peer handling .Drawback is that it hold high packet delayate. In Mesh-based systems, the concept of video stream becomes invalid due to the mesh topology.

B.A Tree Construction Model

We consider a video streaming system composed of a single server and some large number of homogeneous peers. Peers arrive to the system sequentially and connect to a single node in the video distribution tree to start receiving service (i.e., the video stream).Peers in the tree offer service to an arriving peer by simply forwarding to the arriving peer the video stream. We assume that peers always forward the video if they are chosen to be the parent of an arriving node (i.e., all peers are altruistic). Finally, we also assume that peers never leave the system nor move in the distribution tree, thus, their position in the distribution tree is determined at the time of their arrival. Figure 1 illustrates the construction of a video distribution tree

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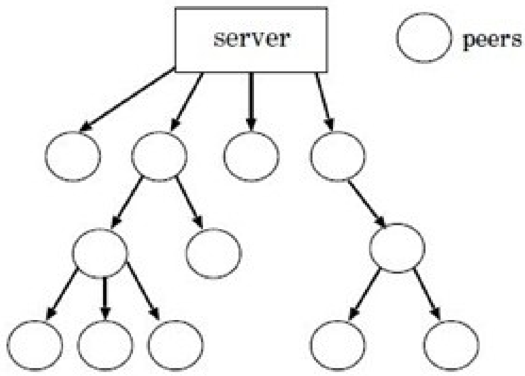

Figure. 1 The Video Distribution Tree

A tree construction mechanism determines where in the current distribution tree an arriving peer should connect to. The mechanism basically determines the parent node of an arriving peer. We assume that such mechanism is inherently an online algorithm, as it has no knowledge of the number nodes that will join the distribution tree nor can the mechanism rearrange the distribution tree,shuffling nodes around as they join the tree. This assumption is rather realistic when considering distributed, large-scale video P2P streaming systems. We consider a very simple model for the tree construction mechanism. In particular, the mechanism takes into consideration the quality of the video stream that the arriving peer will receive when attaching itself to a peer already in the distribution tree (or from the server). Two properties are fundamentally important in determining the quality of a node in the tree:

1. Node degree
2. Node distance.

C.“Optimal” Distribution tree

The mechanisms to construct efficient distribution trees usually consider these two characteristics. However, an important issue to assess the quality of the video distribution tree is the relative impact of these two characteristics. For example, if bandwidth is widely abundant, then node distance impacts video quality relatively more than node degree. To sustain video quality,We overlay the video as description which overcomes the minimum delay and poor quality constraints.

D. Multiple Description Coding

In an ideal P2P streaming system, maximum video quality is offered to a peer and the video stream bit rate exactly matches the available network bandwidth. This implies that a video source is encoded specifically for each peer and instantly follows network bandwidth variations. Because such a system is difficult to scale, the video layer often only supports just a few rates, from which all clients are served. We define rate matching value as the capability of a streaming system to match for each client the video bit rate with the network bandwidth. Two solutions for this issue are layered coding and multiple descriptions coding (MDC). Both offer several quality levels at different bitrates. Layered coding is however not really fault-tolerant. MDC is inherently fault tolerant, since each description is sufficient to display a reasonable quality video. Layered coding is mostly used in single server solutions; the client selects the number of layers that corresponds to the bandwidth to the server. For instance Wave- Video is based on 2D wavelet encoding and offers different quality layers. In Split stream, the authors assume an odd/even frame splitting scheme as an MDC method. They only use the fault tolerance but not the scalability capabilities of MDC.

Multiple Description Coding(MDC) can be seen as another way of enhancing error resilience without using complex channel coding schemes. The goal of MDC is to create several independent descriptions that can contribute to one or more characteristics of video: spatial or temporal resolution, signal-to-noise ratio, frequency content. Descriptions can have the same importance (balanced MDC schemes) or they can have different importance (unbalanced MDC schemes). The more descriptions received, the higher the quality of decoded video. There is no threshold under which the quality drops (cliff effect). This is known as “gracefuldegradation”.

The robustness comes from the fact that it is unlikely that the same portion of the same picture is corrupted in all descriptions. The coding efficiency is reduced depending on the amount of redundancy left among descriptions; however channel coding can indeed be reduced because of enhanced error resilience. Experiments have shown that Multiple Description is very robust: the delivered quality is acceptable even at high loss rates

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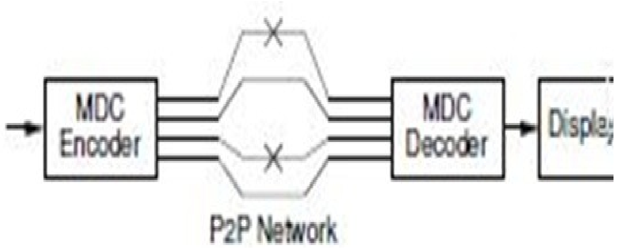

Figure.2 Multiple Description Coding schemas

Descriptions can be dropped wherever it is needed: at the transmitter side if the bandwidth is less than expected; at the receiver side if there is no need, or if it is not possible to use all descriptions successfully received. This is known as "scalability". It should be noted that this is a side benefit of Multiple Description Coding which is not designed to obtain scalability; instead it is designed for robustness. Descriptions of the same portion of video should be offset in time as much as possible when streams are multiplexed. In this way a burst of losses at a given time does not cause the loss of the same portion of data in all descriptions at the same time. If interleaving is used, the same criterion is to be used: descriptions of the same portion of video should be spaced as much as possible. In this way a burst of losses does not cause the loss of the same portion of data in all descriptions at the same time. The added delay due to the amount of offset in time, or the interleaving depth, must be taken into account.

IV. EXPERIMENT RESULTS

The "optimal" distribution tree has a quality superior to both the tree generated by the model and the best complete *k*-ary tree. However, the quality of the tree generated by the model is at most 1/3 lower than the "optimal" tree quality (for the example illustrated in the figure).

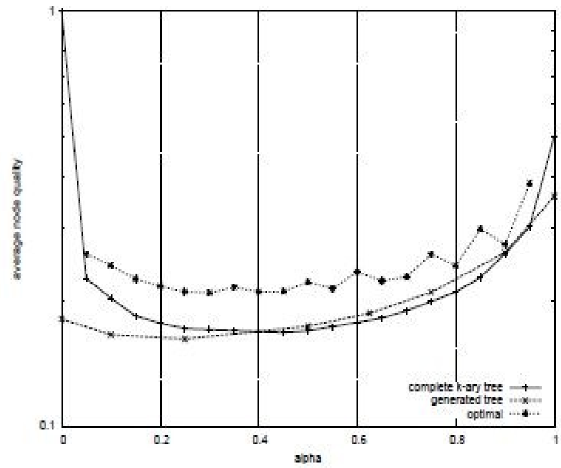

Figure. 3Tree quality for the best complete k-ary tree, the "optimal" tree and the tree generated by the model as a function of α.

We compare the performance of the MD system and the layered system with certain simulation settings. When the replacement time increases,.

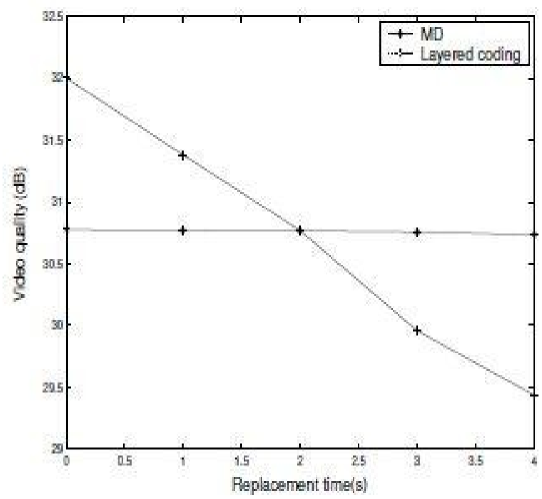

Figure. 4 Video quality (db) Vs. Replacement time(t).

MDC has a better performance than layered coding. The reason is that MD-FEC has an inherent protection against sub stream loss. When a single sub stream is lost, for MD-FEC, the video quality is only slightly affected. But for layered coding, all layers higher than this sub stream cannot be decoded at the receiver

V.CONCLUSION

In this paper, we presented a video Streaming scheme based on a peer-to-peer architecture,

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constructing efficient video dissemination trees. We considered a simple mechanism based on the idea of "preferential attachment". We described a video-on-demand system using peers as servers. By using multiple description coding and streaming different descriptions of a requested video from separate peers, the system is resilient to data losses due to frequent and unpredictable peer going-downs with minimum delay and better quality.

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