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Efficient p2p Video Sharing Scheme in Online Social Network

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ABSTRACT

Nowadays network group, Peer-To-Peer (P2P) network is exploring as a good candidate for resource sharing over the Internet. Compared with traditional file sharing workloads, continuous streaming of multimedia content provokes a significant amount of today's internet traffic. Streaming media has various real-time constraints such as insufficient memory, high bandwidth utilization for large-scale media objects and lack of cooperation between proxies and their clients. Therefore, Sharing of large multimedia objects between similar interests has become predominantly important for on demand video streaming applications. Existing P2P assisted sharing scheme clusters the peers based on similar interest and locality to improve the streaming performance under limited storage constraints. Under these circumstances, it is a challenging task to achieve efficient content delivery under the increased availability of continuous-media streaming.

Keywords **-** *Distinguish hash table (DHT), Online social network (OSN), peer to peer, Video on Demand (VoD).*

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I. INTRODUCTION

Online social networks (OSNs), such as Facebook, MySpace, Orkut, and many others, have expanded their membership rapidly over the last several years. Online social networks (OSNs) (e.g., Facebook, Twitter) are now among the most popular sites on the Web. An OSN provides a powerful means of establishing social connections and sharing, organizing, and finding content. For example, Facebook presently has over 500 million users. Unlike current file or video sharing systems (e.g., BitTorrent and YouTube), which are mainly organized around content, OSNs are organized around users. OSN users establish friendship relations with real world friends or virtual friends, and post their profiles and content such as photos, videos, and notes to their personal pages. These networks interconnect users through friendship relations and allow for asynchronous communications within thus defined social graph. While various OSNs support other types of interactions, including browsing of users' profiles, the bulk of traffic can be attributed to inter-user communications. OSNs continue to expand, and as a result, an ever-increasing amount of computing power and bandwidth are needed to support the communications of the growing user base. At the center of an OSN is the social graph and user data, which are traditionally stored and operated on in a centralized data center. As the result, OSN services can appear unresponsive to users located far away from such data centers.

II. OUTLINE OF THE WORK

1. Video Streaming

Recent advances in the technology have made it possible to transport the live video or stored video over the Internet. The main core of this thesis is concerned with video streaming that refers to the transmission of prerecorded multimedia content and live video by both live and on-demand services. American National Standard for Telecommunications defines streaming as "a technique for transferring data (usually over the Internet) in a continuous flow to allow large multimedia files to be viewed before the entire file has been downloaded to a client's computer".

The basic key sight in video streaming is that server divides the video into a number of segments and then divided parts are transmitted successively to the client end device. On receiving the video, client stores the received parts of video in its buffer and playback the video in its media player without waiting for the entire large video to be downloaded. It facilitates near instantaneous playback of multimedia content irrespective of the video size. The main advantage of the streaming media is to avoid the memory space required to store the whole video content and also reduces start delay. Therefore, it provides scalable and continuous video streaming among the large number of widely distributed clients even under the limited bandwidth and storage constraints.

III. ARCHITECTURE OF VIDEO STREAMING

Video streaming architecture encompasses two major components such as streaming server and a set of clients. In this architecture, the streaming server, client's media player and the streaming technology are tightly coupled to support video streaming across the different systems and platforms. Streaming server is the server that acts as a source of content by storing the more number of videos. Client is an end user composes buffer to store the streamed video and media player to playback the buffered video in a continuous manner.

In order to stream a video, the client builds a connection through the media player to a streaming server. Server starts to stream a video according to the client request based on the streaming mode either live telecast or on-demand media. During streaming, a small buffer is created on the client device and then buffer started to store the streamed video. As soon as the buffer gets full, media player in client device starts to play the video. Like this, media data simultaneously stream at the client side by the streaming server rather than the downloading the whole video content. In order to provide the best effort delivery, buffer eliminates the variations in media reception rate raised due to the non-deterministic nature of the Internet.

3. P2P assisted Video Streaming

Peer-to-Peer video streaming is a decentralized approach that supports for new innovative distributed applications such as social networking and user generated content (forum). It streams video content among the large number of clients who are self organized into a virtual overlay network over the internet.

Each individual client (peers) collaboratively contributes their upload bandwidth to distribute video streams among peers in the network. Here, peer act as a consumer and provider of service. Therefore, peers not only download video content from the streaming server and also can able to upload the downloaded video to the peers those who will requesting it in future. It can significantly reduce the server workload and also achieves high scalability by effectively utilizing the inherent network resources. It can be broadly classified into two categories such as live streaming and video-on-demand.

3.1 Challenges in P2P multimedia Streaming

P2P multimedia streaming have to deal number of challenges for performing large scale video streaming under the various constraints of P2P network. Some of the challenges are portrayed as follows

3.1.1 Peer churn

Due to the dynamic nature of P2P networks, peer may frequently join and leave the network without giving any prior announcement to the other peers in the network. It may affects the playback continuity of the stream since delivering peer may leave from the network during streaming session. Therefore, overlay maintenance protocol maintains the structural information of P2P overlay by predicting its dynamic nature. Furthermore, this protocol locates new peers as soon as possible to avoid the impact caused because of the departure of any delivering peer from the network.

3.1.2 Peer heterogeneity

In P2P networks, Peers are heterogeneous in terms of access networks, bandwidth and client end device. In access network level, heterogeneity exists in the type of networks (ADSL, WiFi, 3G) are used to collaboratively coordinate the set of client peers. Each peer has different bandwidth capability and support different services or applications. The utilization of heterogeneous bandwidth resources may affect the streaming rate therefore P2P video streaming should leverage peer contribution in order to ensure streaming feasibility.

3.1.3 Scalability

In P2P networks, peers in the network are self organized into a logical overlay over the internet. The overlay construction process incurs high overhead when the number of peers in the network increases correspondingly. It may reduce the performance of the system drastically. Therefore, the main challenge in P2P video streaming is to construct the highly scalable P2P overlay with less construction overhead.

3.1.4 Choosing Suitable peers

In order to minimize the end-to-end delay, suitable peers with sufficient bandwidth resources must be selected to perform communication. It provides real time multimedia content in a reliable manner with less communication overhead.

3.1.5 Monitoring of network conditions

Due to the dynamic nature of P2P architecture, the network condition varies dramatically during streaming session. Therefore, the network condition must be effectively monitored to improve the streaming performance.

3.1.6 Incentives for contributing peers

Peers in a P2P VoD system might be selfish in nature that utilize other peer's resources but would not be willing to contribute its own resources (upload bandwidth) and memory space. This type of peers is called free riders that do not participate in the video dissemination. Hence, it is critical to design an effective incentive scheme. Many incentive schemes are proposed for traditional P2P file sharing applications whereas only limited work has been focusing on incentive schemes in P2P VoD systems. Therefore, it is challenging to design proper incentive scheme to stimulate peers for contributing their resources to the network.

3.1.7 Effective video coding scheme

The transmission of multimedia content over network leads to data loss due to its very sensitive nature. Therefore, a multimedia content must be encoded using an effective video coding scheme before it is transmitted over the network. It offers high reliable streaming even under peer dynamics and high heterogeneity.

I. FIGURES AND TABLES

BLOCK DIAGRAM:

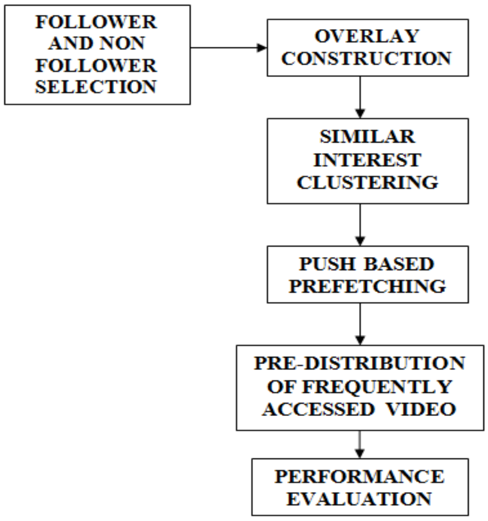


Fig.1 Block Diagram of Online social Network

1. Overlay Construction

Social Tube establishes a per-node (in contrast to per-video in YouTube) P2P overlay for each source node. It consists of peers within 2 hops to the source that watch at least a certain percentage (> Tl) of the source's videos. Other peers can still fetch videos from the server. we build a hierarchical structure that connects a source node with its socially-close followers, and connects the followers with other non-followers. Thus, the followers can quickly receive chunks from the source node, and also function as a pseudo-source to distribute chunks to other friends. The source pushes the first chunk of its new video to its followers.

To identify followers and non-followers of a source node for structure construction, SocialTube pre-defines two thresholds, Th and Tl, for the percent of videos in the source node that a viewer has watched during a time unit, say one week. If the percent value of a viewer is $\geq$ Th, the viewer is a follower. If the percent is Tl < x $\leq$ Th, the viewer is a non-follower.

2. Similar Interest Clustering

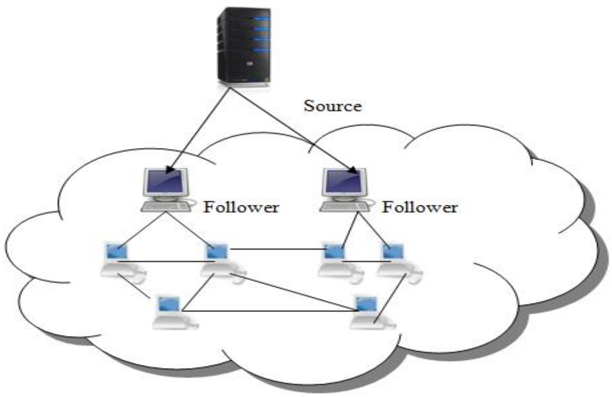
The chunk is cached in each follower and has high probability of being used since followers watch almost all videos of the source. Further, non-followers sharing the same interest are grouped into an interest cluster for video sharing. We call peers in an interest cluster interest-cluster-peers. A node that has multiple interests is in multiple interest clusters of the source node. Because the source node and followers are involved in every interest cluster for providing video content, we call the group formed by the source, followers, and interest cluster- peers in an interest cluster swarm, and call all nodes in a swarm swarm-peers.

3. Push based Prefetching

To reduce the video startup latency, we propose a push based video Prefetching mechanism in SocialTube. In SocialTube, when a source node uploads a new video to the server, it also pushes the prefix (i.e. first chunk) of the video to its followers and to the interest-cluster peers in the interest clusters matching the content of the video. The prefix receivers store the prefix in their cache. Once the nodes request the videos, the locally stored prefix can be played immediately without delay. Meanwhile, the node tries to retrieve the remaining video chunks from its swarm-peers.

It first contacts interest cluster-peers, then followers, then the source node. If the requester still cannot find 4 providers after the source node is contacted, it resorts to the server as the only provider. The algorithm takes advantage of all resources for efficient video sharing without overloading specific nodes.

Architechture:



4. Pre-distribution of frequently accessed video

Efficiency of the video sharing is improved in the server through the mechanism of identifying frequently accessed videos and distributing it to the followers of the source node. This mechanism facilitates the fast transmission of the video to the peers from the follower. Server maintains the access count of each video in its list. If certain video is accessed more then it is distributed to the follower beforehand.

4.1 Performance Evaluation

4.1.1) Chunk transmission delay:

This is the chunk transmission time between two peers. This metric shows the delay in retrieving video chunks.

4.1.2) Average overlay maintenance cost:

This is the number of communication messages between neighboring nodes for overlay maintenance.

The performance of Socialtube is compared with other representative works in peer-assisted video streaming, Random (as a baseline). Random clusters peers randomly regardless of their friendships, locations and interests. Nodes in a cluster connect with each other randomly, and use flooding for video search. Socialtube greatly reduces the workload of the server, improves the quality of playback, and scales well to a large client population.

IV. CONCLUSION

Video sharing is an increasingly popular application in OSNs. However, the client/server architecture deployed by current video sharing systems in OSNs costs a large amount of resources (i.e. money, server storage) for the service provider and lacks scalability. Meanwhile, because of the privacy constraints in OSNs, the current peer-assisted Video-on-Demand (VoD) techniques are suboptimal if not entirely applicable to the video sharing in OSNs. In this paper, we crawled video watching trace data in one of the largest online social network websites Facebook, from Jul. 2007 to Aug. 2010 and explored the users' video viewing patterns. We found that in a user's viewer group, 25% viewers watched all videos of the user driven by social relationship, and the viewing pattern of the remaining nodes is driven by interest. Based on the observed social and interest relationship in video watching activities, we propose Socialtube, which provides efficient P2P-assisted video sharing services. Extensive simulation results show that Socialtube can provide a low video startup delay and low server traffic demand. We also implemented a prototype in Planet Lab to evaluate the performance of Socialtube. The experimental results from the prototype further confirm the efficiency of Socialtube.

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Biographies and Photographs

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