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Broker Based Content Distribution For P2p Assisted Multimedia Sharing In Online Forums

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Abstract: *An Online forum is a powerful tool for sharing information where the user can communicate with people who have the same or similar interest. These days, multimedia contents (e.g., images and videos) are shared to a greater extent in the forums as attachments. As a result of increasing number of people paying attention to share more and more multimedia contents, server-client model has begun to fall short to meet the increasing need of bandwidth and storage resources consumption. So, it is advantageous to develop a method to enable forums to share multimedia contents in an efficient, low-cost and user-friendly manner. In order to reduce bandwidth cost, a peer-assisted multimedia sharing system, called Multimedia Board (MBoard) was projected that leverages forum characteristics to provide forums with their own multimedia sharing. We proposed an efficient hybrid system in order to reduce the load on the server while improving a high quality of service for the users. P2P network is constructed in the form of a two tier architecture, where the upper tier is composed of structured DHT stable node and the lower tier is composed of other nodes connecting to the selected stable nodes in the form of unstructured network. And also Broker-Based Content distribution is developed to support efficient P2P multimedia content retrieval with efficient group membership management.*

Keywords: *Online Forum, Video On Demand, Peer to Peer Networks, Distributed Hash Table, MBoard.*

I. INTRODUCTION

User-generated content (UGC) is becoming the most popular and valuable information available on the WWW. The advent of user generated content (UGC) has dramatically reshaped the landscape of Internet, shifting the role of many websites from creating online content to providing facilities for Internet users to publish their own content and empowering the role of Internet users from content consumers only to content publishers, referees and consumers. Video-on-demand over IP (VOD) is one of the best-known examples of "next-generation" Internet applications cited as a goal by networking and multimedia researchers. Streaming Video-on-Demand (VOD) over the Internet is the next major step in the evolution of media content delivery.

Skype is a peer-to-peer VoIP client developed by the organization that created Kazaa. Skype also supports instant messaging and conferencing. It uses a combination of hashing and periodic controlled flooding to gain information about the online Skype users. Skype search mechanism falls back to the login server for all unsuccessful and some successful searches. The memory usage and process priority of Skype is compared with three major clients such as Yahoo, MSN and Google Talk clients. Among that, Skype changes its priority to High priority, when a call is established. It provides better voice quality than other VoIP clients. Memory usage and process priority are high in Skype but it only deploys P2P networking in telephony protocol not for media sharing[7].

In the server-client model, multimedia objects with limited size and resolution are allowed to be uploaded as attachments due to the bandwidth limit of the server. Thus, people have to post multimedia materials such as videos and high-resolution pictures as links to third party service providers such as YouTube. This brings an inconvenience to the forum users. Also, YouTube places limits on the size of video files that users are allowed to upload; the maximum limit for uploads 2 GB for normal users. In addition, the third party services sometimes are not available. For example, YouTube allows to upload of nearly all videos so its service is banned in many countries due to videos of political topics. Another drawback using third party services is the inclusion of embedded commercials [9] since YouTube try to turnover from commercials embedded in the website and videos themselves [10].

Consequently, it is beneficial to develop a method to enable forums to share multimedia contents in a well-organized, inexpensive and user-friendly manner. Specifically, multimedia content should be shared in a way such that the bandwidth cost will remain within a range acceptable by forum runners and the intensity of server access will not exceed a typical web servers' capacity. As a result we proposed a peer-assisted multimedia sharing system, called Multimedia Board (MBoard) that leverages forum characteristics to provide forums with their own multimedia sharing capabilities in order to reduce bandwidth cost. This work does not lie in the improvement of existing P2P networks, but adopting existing P2P techniques suitable for forums to improve the performance of multimedia sharing in forums. When a node is downloading and viewing media content, it can upload the content simultaneously. In order to efficiently share media content, MBoard uses segmented media content to avoid the possibility of downloading failure and enable users to share existing media segments while downloading others. Server could be designated to be in charge of helping users locate media content. In such a system, the server manages the indexing of media segments. A media requester asks the server for the providers of its requested media, and media holders report to the server for index updates. However, frequent node joins and departures and media holder creation and removal lead to frequent index updates and server communication. This generates additional load on the server, though it is relatively small compared to that of uploading media.

The rest of this paper is structured as follows: Section 2 presents a concise review of related works. Section 3 briefly presents the methodology of MBoard with Broker based content sharing in online forums. Section 4 reports the simulation experimental results of Broker based content sharing. The final section presents a conclusion with a discussion on further work.

II. RELATED WORK

Ochoa et al., [1] identified that the UGC production follows "long-tail" distributions and it is marked with a strong "participation inequality".

W. P. Ken Yiu et al., [2] has proposed VMesh a distributed peer-to-peer video-on-demand (VoD) streaming scheme which efficiently supports random seeking functionality. VMesh supports the interactive VoD service. VMesh utilizes the large total storage capacity of peers to improve the supply of video segments .An overlay mesh is built upon peers to support jumping forward/backward, pause and restart during playback. In VMesh, videos are divided into smaller segments (identified by segment IDs) and stored in peers distributed over the network. A new node can quickly locate nodes with the first several segments through DHT routing. Searching time via DHT is shown to be O (logN) where N is the number of nodes in the system. The latency is significantly reduced here.

K. Pussep et al., [3] has proposed a peer-assisted Video-on-Demand (VoD) streaming systems in an attractive way to distribute video content through the Internet at low cost. It improves service quality in P2P video streaming and provides high support for VoD streaming. In order to avoid under capacity and service degradation in peer assisted Video-on-Demand streaming, two adaptive allocations policies such as Global Speed Policy and Supporter Policy are proposed. In order to utilize high capacity peers efficiently, Give-to-Get (G2G) system, a mesh-based protocol is utilized for VoD streaming.

Haiying Shen and Cheng-Zhong Xu [4] have proposed a hash-based proximity clustering approach for load balancing in heterogeneity DHT. In this approach, DHT nodes are classified as regular nodes and super nodes according to their computing and networking capacities. Regular nodes are grouped and associated with super nodes via consistent hashing of their physical proximity information on the Internet. The super nodes form a self-organized and churn resilient auxiliary network for load balancing. It achieves high load balancing and provides strong resilience to the effect of churn. And also greatly reduces the overhead of resilient randomized load balancing algorithms due to the use of proximity information.

A. L. H. Chowl et al., [5],has proposed a multipath and FEC approach that intelligently splits the FEC-encoded stream among multiple available paths to facilitate effective multimedia sharing. It facilitates effective multimedia sharing and reduces packet loss.

Zhenyun Zhuang, Yunhao Liu, Li Xiao[6] were proposed Dynamic Layer Management algorithm (DLM) maintains the optimal layer size ratio and adaptively adjusts the peers between super-layer and leaf-layer. It is completely distributed in the sense that each peer decides to be a super-peer or a leaf peer independently without the global knowledge. Super-peer P2P system maintains the optimal layer size ratio and quality of a super-peer system can be significantly improved. It keeps the peers with larger lifetimes and capacities as super-peers, and keeps the peers with shorter lifetimes and capacities as leaf-peers

A. Salman et al., [7] has proposed the key Skype functions such as login, NAT and firewall traversal, call establishment, media transfer, codecs, and conferencing under various network setups. Skype is a peer-to-peer VoIP client developed by the organization that created Kazaa. Skype also supports instant messaging and conferencing. It uses a combination of hashing and periodic controlled flooding to gain information about the online Skype users. It provides better voice quality than other VoIP clients. Memory usage and process Priority are high in Skype. It can deploy P2P networking in telephony protocol.

III. METHODOLOGY

A. Surveillance on Online Forums

Online Forums are prevailing tools for sharing information. It is used to gain knowledge, share ideas or simply to feel as part of a community. It is also used to communicate with people who have the same or similar interests and be up to date with latest news and trends. The discussion forum has the following guidelines: Registration, Validation, Rules, Posting, Threads, and Moderating. These observations provide guidance to us in designing MBoard as a practical scheme in forums to enable peer assisted multimedia support.. The forums tend to have a large number of users, which is optimal for the P2P model. The P2P model yields higher efficiency in a larger scale since the content uploading load can be distributed among more content holders. MBoard employs the P2P model, in which the content information should be stored and retrieved in a P2P manner. This helps to reduce the server bandwidth cost and user waiting time.

B. Configuration of M-Board

A peer-assisted multimedia sharing system, called Multimedia Board (MBoard) that leverages forum characteristics to provide forums with their own multimedia sharing capabilities is called M-Board. MBoard employs the P2P model, in which the content information should be stored and retrieved in a P2P manner. This helps to reduce the server bandwidth cost and user waiting time. MBoard builds nodes in one forum into a P2P network. It leverages stable nodes to enhance content discovery efficiency. MBoard uses a two-tier structure, which has been widely used and studied in P2P networks. In a super-peer structure, peers are divided into two classes: high-capability super-peers that handle search or routing, and ordinary peers that act as their clients. A client performs a search by submitting a search query to its super-peer. MBoard intelligently forms a certain number of stable nodes into a DHT to assist content discovery by aggregating content indices and matchmaking content requesters to providers. Specifically, MBoard builds a two-tier structure, with the DHT in the upper tier and other nodes connecting to the selected stable nodes in the lower tier. The nodes connected to a stable node are called child nodes of the stable node. Since the selected stable nodes perform media content indexing, they are called

brokers. MBoard enables a user to find requested content from other users within the forum most of the time while constraining the searching path length by avoiding large-size networks.

C. Group Membership Management

A DHT node uses a constant hash function to hash the identifier of nodes and data objects to keys. It has two functions: Insert and Lookup to store the object with the key to its owner node and retrieve the object with the key. A node whose key is the closest to the object's key should be its owner node. In a DHT, each node maintains a routing table for log n neighbors. In order for a new node to join in the DHT overlay, it must know at least one other node already within the DHT. And the node joins the DHT using the DHT node join protocol. Each time a stable node leaves the network; the node executes the DHT departure protocol and notifies the server. When a node joins in MBoard, the server randomly picks a stable node and assigns it to the newcomer as their parent. A parent helps its child nodes to send out content requests and receive replies from other nodes.A two level DHT structure is formed as shown in Fig. 1. Considering the high dynamism of child nodes, we let child nodes build and maintain connections to their parent. Therefore, the parents (i.e., nodes in DHT) function like brokers without the need to maintain the connection to their child nodes. We can provide incentives such as giving higher priorities to brokers' media requests to encourage stable nodes to function as brokers.

D. Multimedia Content Registration

In MBoard, the stable nodes function as brokers to match content requesters and providers. For the media segment v posted by a user uv, after uploading it to the server, user uv registers itself as the content provider to v's broker bv by telling bv its IP address. Specifically, it asks its parent to send a Insert (key, index) request to the DHT. The key is the consistent hash value of the name of the media segment v, and the index includes the node's IP address, content segment name, etc. Using the DHT routing protocol, the request will be forwarded to the broker bv of segment v. The recipient broker then adds a record in the list of providers for this content segment. When a node is viewing/downloading a multimedia segment from the server or another peer, it also asks its parent to send a Insert (key, index) request to the DHT in order to register itself as the content provider.

E. Broker-Based Content distribution

When user u1 is watching media segment v, u1 asks its parent b1 to send a message to the broker of v to register it as a media segment v's provider. To retrieve a media segment, a requester asks its parent to send a request Lookup (key). The request will be forwarded to the broker of the segment that holds the registered index of the providers of the segment. The broker looks for the providers of the requested segment and returns a set of the latest registered providers to the requester. The broker returns a number of providers rather than a single provider in order to increase the probability that at least one provider is available. Also, it chooses the latest providers in order to increase the probability that they are still online. The requester then contacts the segment providers for the content. If there is no peer provider, the requester asks the server for the segment. A broker node can be a stable node, but all stable nodes is not being a broker node.

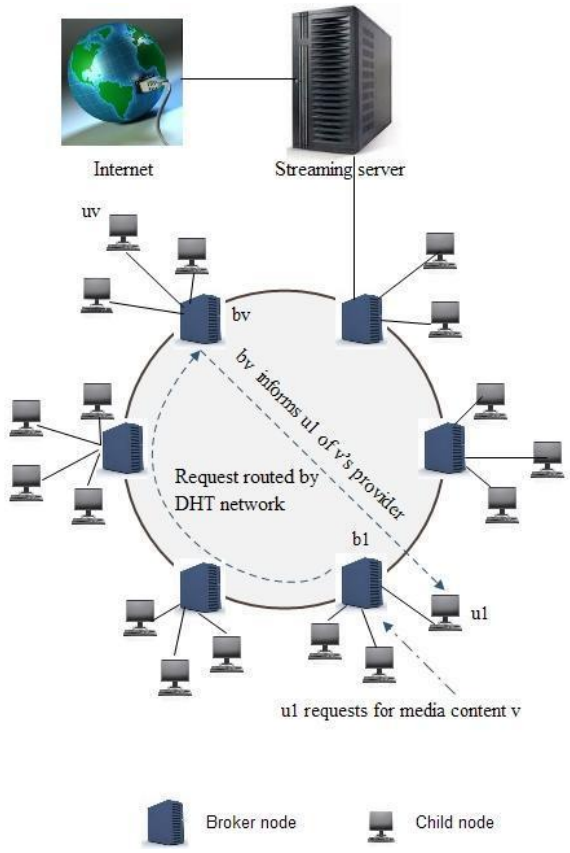

Fig. 1.Two Level DHT network-Hybrid Form

For example, in Fig. 1, u1 sends its request for content v to b1, which further sends it using the DHT routing protocol. The request finally arrives at bv. Then, bv looks up for v in its registered media segments. If v is available, bv returns a number of nodes holding v to u1. When u1 finishes downloading the content from one of the content providers, it sends a registration request to register itself as a content holder in bu. If v is unavailable, then it will inform to fetch v from the server instead.

IV. EXPERIMENTAL ANALYSIS

A. Selecting a Broker

1. If Node (u) daily online time exceeds the predefined threshold, that information will be reported to the server.
2. Server adds node (u) to its stable node list. Generally, the server will maintain two types of lists: Stable node list (nodes that are not selected as brokers) and broker list(nodes that currently serve in the DHT).
3. Nodes in the stable node list are ordered according to their capacities.
4. Among that, the highest capacity stable node will became a Broker.

For most excellent performance, the number of brokers, N should not be large(with the intention of avoiding long routing latency) and the number of brokers, N should not be too small(with the intention of avoiding bottlenecks).To determine N, estimate the number of brokers at different times and use the average value over time.

The peer assisted multimedia sharing system, called MBoard. It utilizes the P2P model, in which the content information should be stored and retrieved in a P2P manner. MBoard uses segmented media content to avoid the possibility of downloading failure. So it can significantly reduce the load on the server while maintaining a high quality of service for the users. This helps to reduce the server bandwidth cost and user waiting time.

B. The Significance of Broker Nodes

The CDF of the percentage of users versus video playback delay when all nodes are on the DHT and when only broker nodes are on the DHT, respectively are shown in fig 2. When only broker nodes are on the DHT, 30 percent of nodes have no more 0.6 second delay, 50 percent of nodes have no more 0.7 second delay, and 93 percent of nodes have no more 0.9 second delay. While when all nodes are on the DHT, 30 percent have no more 3 second delay, 50 percent of nodes have no more than 3.5 second delay, and 93 percent of nodes have no more 5 second delay. In both cases, around 96 percent of users have delays no more than 10 seconds.

Therefore, the delay of using broker nodes is less for most users than placing all nodes in the DHT. This is because the size of the DHT when putting all nodes on the DHT is much larger than only using broker nodes, which increases the number of routing hops and the routing delay. The frequent churn also increases the number of routing hops.

The P2P contribution percentage from the first day to the seventh day when all nodes are on the DHT and when only broker nodes are on the DHT are shown in Fig 3.When only broker nodes are on the DHT, the P2P contribution percentage is 80 percent on the first day, and it increases to 90 percent and maintains nearly constant in the remaining days. When all nodes are on the DHT, the P2P contribution percentage is 60 percent on the first day, and it increases to 70 percent and maintains nearly constant in the remaining days. In both cases, the percentage is low on the first day because few peers have requested video segments initially. Thus, more users ask the server for video segments. Later, as more and more peers have requested video segments, users can retrieve video segments from their peers, leading to a higher and constant P2P contribution percentage.

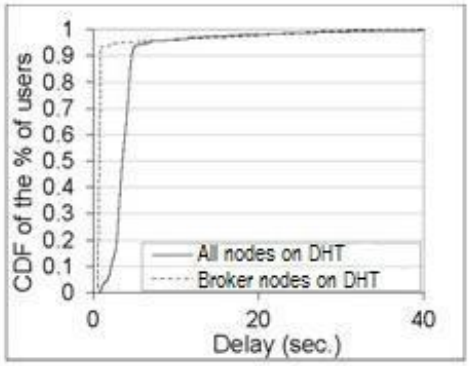

Fig. 2. Effect of broker nodes on delay

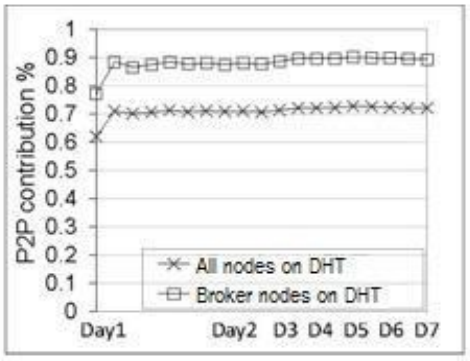

Fig. 3. Effect of broker nodes on P2P contribution

C. The Effect of Forum Popularity

Our purpose is to show the effectiveness of MBoard at different levels of forum status. The forum status is the number of thread accesses during a certain period of time. We calculated the popularities of the forums and ordered the forums in an descending order of the popularity. We chose the last, two-thirds and one-third popularities in the list as the highest popularity, medium popularity, and low popularity, respectively, and tested the MBoard forum with different popularities. Fig.4 demonstrates the P2P contribution at varying levels of popularity. The P2P contribution in high, medium, low popularity forums is around 85, 68, and 45 percent, respectively. As expected, the contribution increases with popularity because there are more online users with the requested videos.

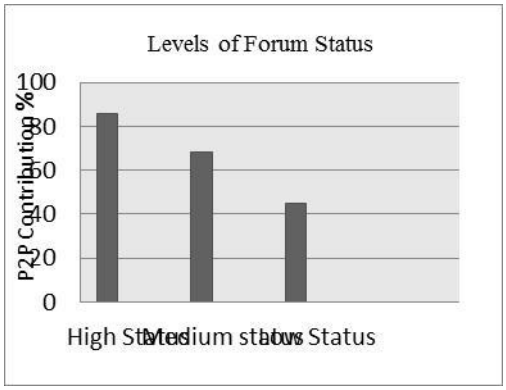

Fig. 4. Effect of popularity on P2P contribution

V. CONCLUSION AND FUTURE WORK

To provide the well-organized multimedia sharing in online forums among the large group of users, P2P model is employed. It overcomes the inadequacies in the conventional server-client model due to limited server bandwidth. MBoard system is proposed to provide the P2P-based multimedia sharing in forums or other mediums to deliver user generated multimedia content. MBoard utilizes a two-tier DHT network to leverage the stable nodes for content discovery in peers. And then Broker-based content sharing and refreshing schemes is proposed to reduce communication cost. It greatly reduces the load on the server and achieves high P2P sharing efficiency and low playback waiting time. Our future work lies in deploying MBoard in a real forum to better evaluate its performance. Also, we will study the properties of other online forums where users have very different access patterns and investigate whether MBoard is useful in these forums .Further, we will consider other factors that affect the quality of service such as the formats of the video clips, limited and shaped up-link bandwidths, and long network delay in the experimental environment in order to study how these factors influence the performance.

REFERENCES

[1] X. Ochoa and E. Duval, "Quantitative Analysis of User-Generated Content on the Web," Proc. First Int'l Workshop Understanding Web Evolution (Web Evolve '08), 2008

[2] W.P.K. Yiu, X. Jin, and S.H.G. Chan, "VMesh: Distributed Segment Storage for Peer-To-Peer Interactive Video Streaming," IEEE J. Selected Areas on Comm., vol. 25, no. 9, pp. 1717-1731, Dec. 2007

[3] K. Pussep, O. Abboud, F. Gerlach, R. Steinmetz, and T. Strufe, "Adaptive Server Allocation for Peer-Assisted VoD," Proc. IEEE Int'l Symp. Parallel Distributed Processing Workshops and Phd Forum (IPDPSW), 2010

[4] H. Shen and C.-Z. Xu, "Hash-Based Proximity Clustering forEfficient Load Balancing in Heterogeneous DHT Networks,"J. Parallel and Distributed Computing, vol. 68, pp. 686-702, 2008.

[5] A.L.H. Chow, H. Yang, C.H. Xia, M. Kim, Z. Liu, and H. Lei, "EMS: Encoded Multipath Streaming for Real-Time Live Streaming Applications," Proc. IEEE 17th Int'l Conf. Network Protocols (ICNP), 2009.

[6] Z. Zhuang, Yunhao Liu, Li Xiao, "Dynamic Layer Management in Superpeer Architectures," IEEE Trans. Parallel and Distributed Systems, vol. 16, no. 11, pp. 1078-1091, Nov. 2005.

[7] S.A. Baset and H. Schulzrinne, "An Analysis of the Skype Peer-to-Peer Internet Telephony Protocol," Proc. IEEE INFOCOM, 2006.

[8] "Internet Usage Statistics," http://www.internetworldstats.com/stats.htm, 2011.

[9] "PPLive," http://www.pplive.com, 2011.

[10] "Google Launches YouTube Video Ads," http://www.readwriteweb.com, 2011.