International Conference on Systems, Science, Control, Communication, Engineering and Technology 2015 [ICSSCCET 2015]

ISBN	978-81-929866-1-6	**VOL**	01
Website	icssccet.org	**eMail**	icssccet@asdf.res.in
Received	10 - July - 2015	**Accepted**	31- July - 2015
Article ID	ICSSCCET010	**eAID**	ICSSCCET.2015.010

MULTIPATH BROADCAST AND GOSSIP BASED APPROACH FOR VIDEO CIRCULATION

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Abstract: *LIVE media streaming applications have become more and more popular. IP multicast is the most efficient mechanism but Due to the practical issues of routers, IP multicast has not been widely deployed in the wide-area network infrastructure. The application-level solution build a peer-to-peer (P2P) overlay network out of unicast tunnels across cooperative participating users. P2P media streaming has become a promising approach to broadcast non interactive live media from one source to a large number of receivers. Design of a live P2P streaming system faces many challenges. Therefore, no single application-level multicast stream can meet the requirements of everyone. The proposed architecture aims to provide higher streaming quality and to provide robustness. In the Proposed System the Parallel efforts have been exerted in the media streaming field and networking field to avoid the problem of distributing LIVE video. The tree-based approaches are vulnerable for dynamic group variation but the gossip based mesh-like topology for overlay network systems allow peers to form multiple neighbors, so multilayered video contents are distributed among mesh-like network. Due to this multisource transmission scheme, packets can be exchanged among clients efficiently. In Proposed, The system can achieve improved performance on video delivery quality, bandwidth utilization, and service reliability when using the peer-assisted multipath transmission.*

I INTRODUCTION

Multicasting is a natural paradigm for streaming live multimedia to multiple end receivers. Since IP multicast is not widely deployed, many application-layer multicast protocols have been proposed. However, all of these schemes focus on the construction of multicast trees, where a relatively small number of links carry the multicast streaming load, while the capacity of most of the other links in the overlay network remain unused. Recently, there are many research interests in providing efficient and scalable multimedia distribution service. However, stringent quality-of-service (QoS) requirements for media distribution, as well as dynamically changing and heterogeneous network capacity in today's best effort Internet, bring many challenges. A novel framework for multimedia distribution service based on peer-to-peer (P2P) networks is introduced. A topology-aware overlay is proposed in which hosts self-organize into groups. End hosts within the same group have similar network conditions and can easily collaborate with each other to achieve QoS awareness. In order to improve media delivery quality and provide high service availability, there are two distributed heuristic replication strategies, intergroup replication and intragroup replication, based on this topology-aware overlay. Specifically, intergroup replication is aimed to improve the efficiency of media content delivery between the group where a request is issued and the group where the content is stored. Also, intragroup replication is targeted at improving the availability of the content. The requirement of global knowledge impairs their applicability to very large-scale groups. Gossip-based protocols for group communication provide attractive scalability and reliability properties.

Cite this article as: S. Ganapathi Ammal, T. Yawanikha, S. Thavasi Anand. "MULTIPATH BROADCAST AND GOSSIP BASED APPROACH FOR VIDEO CIRCULATION." *International Conference on Systems, Science, Control, Communication, Engineering and Technology (2015)*: 38-42. Print.

II RELATED WORKS

Although there have been significant research efforts in peer-to-peer systems during the past five years, one category of peer-to-peer systems has so far received less attention: the peer-to-peer media streaming system. The major difference between a general peer-to-peer system and a peer-to-peer media streaming system [4] lies in the data sharing mode among peers: the former uses the 'open-after-downloading' mode, while the latter uses the 'play-while-downloading' mode. More specifically, in a peer-to-peer media streaming system, a subset of peers own a certain media file, and they stream the media file to requesting peers. On the other hand, the requesting peers playback and store the media data during the streaming session, and they become supplying peers of the media file after the streaming session.

Multimedia distribution services basically fall into three categories:

1) centralized multimedia distribution;
2) CDN-based multimedia distribution; and
3) P2P networks. In the centralized multimedia distribution approach, a centralized multimedia server is deployed to support clients to access multimedia content across the Internet.

In order to enhance the storage and capacity of the centralized server and to improve the service availability, server clustering or mirroring are proposed. Although those techniques are widely deployed in traditional distribution service, the performance of the centralized architecture is very limited, as this architecture does not work well when there is a bottleneck in the network. To overcome the limitation in centralized distribution architecture, CDN-based multimedia distribution service [3], e.g.,Akamai, deploys a large number of servers at the edge of the network. The objective is to efficiently redirect user requests to appropriate servers so that request latency is reduced and load among servers are balanced. The infrastructure, including servers and network links, is engineered to provide a high level of performance guarantee. However, there are some limitations for the CDN-based architecture to provide efficient distribution service.

III PROBLEM STATEMENT

In the Internet architecture, the internetworking layer, or IP, implements a minimal functionality — a best-effort unicast datagram service, and end systems implement all other important functionality such as error, congestion, and flow control. Such a minimalist approach is one of the most important technical reasons for the Internet's growth from a small research network into a global, commercial infrastructure with heterogeneous technologies, applications, and administrative authorities. The growth of this network has in turn unleashed the development of new applications, which require richer network functionality.

IPMulticast is the first significant feature that has been added to the IPlayer since its original design and most routers today implement IPMulticast. Despite this, IPMulticast [1] has several drawbacks that have so far prevented the service from being widely deployed. First, IPMulticast requires routers to maintain per group state, which not only violates the "stateless" architectural principle of the original design, but also introduceshigh complexity and serious scaling constraints at the IPla yer. Second, IPMulticast is a best effort service, and attempts toconform to the traditional separation of routing and transport that has worked well in the unicast context. However, providing higher level features such as reliability, congestion control, flow control, and security has been shown to be more difficult than in the unicast case. Finally, IPMulticast calls for changes at the infrastructural level, and this slows down the pace of deployment. In this paper, the issue of whether multicast related functionality should be implemented at the IPlayer [6] or at the end systems. In particular, a model in which multicast related features, such as group membership, multicast routing and packet duplication, are implemented at end systems, assuming only unicast IPservice [1].

Tree-based protocols and extensions

Many overlay streaming systems employ a tree structure, stemmed from IP multicast. Constructing and maintaining an efficient disuibution tree among the overlay nodes is a key issue to these systems. In CoopNet [8], the video source, as the root of the tree, collects the information of all the nodes for tree construction and maintenance. Such a centralized algorithm can be very efficient. but relies on a powerful and dedicated root node. To the contrary, drstributed algorithms, such as SpreadIt, NICE [15], and ZIGZAG [9], perform the constructing and routing functions across a series of nodes. For a large-scale network, these algorithms adopt hierarchical clustering to achieve minimized transmission delay (in terms of tree height) as well as bounded node workload (in terms of fanout[17] degree). Still, an internal node in a tree has a higher load and its Ieave or crash often causes buffer underflow in a large population of descendants.

Gossip-based protocols

Gossip (or epidemic) algorithms have recently became popular solutions to multicast message dissemination in peer-to-peer systems. In a typical gossip algorithm, a node sends a newly generated message to a set of randomly selected nodes; these nodes do similarly in the next round, and so do other nodes until the message is spread to all. The random choice of gossip targets achieves resilience to random failures and enables decentralized operations. The data delivery method in UONet [12] is also partially motivated by the gossip concept. Nevertheless, the use of gossip for streaming is not straightforward because its random push may cause significant redundancy. which is particularly severe for high-bandwidth streaming applications.

IV PEER-TO-PEER NETWORK

The P2P network that facilitates the Peer Streaming system is for a particular streaming session, let the server be a node that originates the streaming media. Let the client be a node that currently requests the streaming media. Let the serving peer be a node that serves the client with a complete or partial copy of the streaming media. In the Peer Streaming system, the server, the client and the serving peers are all end-user nodes connected to the Internet. Because the server is always capable of serving the streaming media, the server node is always a serving peer.

Intra-overlay optimization

With the improvement of network bandwidth, multimedia services based on streaming live media, such as IPTV have gained much attention recently. Significant progress has been made on the efficient distribution of live streams in a real-time manner over a large population of spectators with good QoS.

Due to the practical issues of routers, IP multicast has not been widely deployed. Therefore, researchers have expended a lot of effort building an efficient streaming overlay multicast scheme based on P2P networks in which spectators behave as routers for other users. Efficient and scalable live-streaming overlay construction has become a best approach.

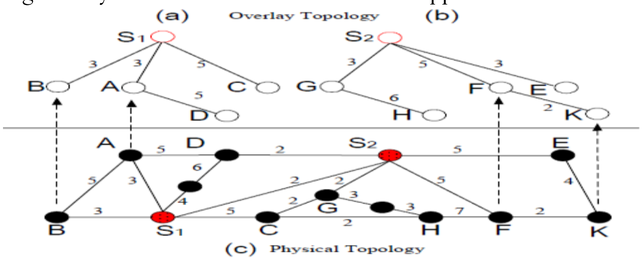

Fig 2: Intra-overlay optimization:(a) optimal multicast tree rooted at S1:(b) optimal multicast tree rooted at S2; (c) physical topology

Fig 2 shows an example of intra-overlay optimization with two logical streaming overlays. Peers A, B, C and D join the stream originating at S1 and peers E, F, G, H and K join the stream originating at S2. The number on each edge represents the cost of the link between two nodes.

B. P2P-based multimedia distribution service architecture

P2P based multimedia distribution service framework that will be QoS-aware, scalable, and cost-effective. The clients join the P2P network and contribute resources such as storage to the system. The multimedia contents are stored in peers storage, and each peer distributes the contents or streaming service to other peers. In order to provide QoS-aware multimedia distribution service, a topology-aware network is necessary. This architecture is proposed to build a topology-aware overlay network. In such a network, nearby hosts or peers are clustered into application groups. Since peers within one group are very close to each other, the QoS requirements for content delivery, such as latency, can be easily satisfied. Generally speaking, hosts that go through the same gateway to the Internet or within a subnetwork can naturally belong to one group.

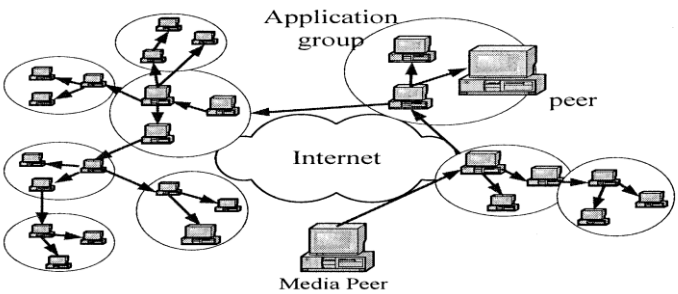

Fig 3: Peer-to-peer based multimedia distribution service.

The constructed overlay network can significantly decrease the communication cost between end-hosts by ensuring that a message reaches its destination with small overhead and highly efficient forwarding. Resource management is one of most important

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components in our P2P-based multimedia distribution service. In order to improve system delivery performance and provide high service availability, efficient replication strategies are key elements of the resource management. The purpose of replication strategies is to determine how many replicas of multimedia contents are needed and where to place those replicas. Replication among groups is helpful for accelerating the dissemination of multimedia content. Replication within one group improves the robustness of media distribution service.

Node join and membership management

Each DONet node has a unique identifier, such as its IP address. and maintains a membership cache (mCache) containing a partial list of the identifiers for the active nodes in the DONet. In a basic node joining algorithm a newly joined node first contacts the origin node, which randomly selects a deputy node from its mCache and redirects the new node to the deputy.

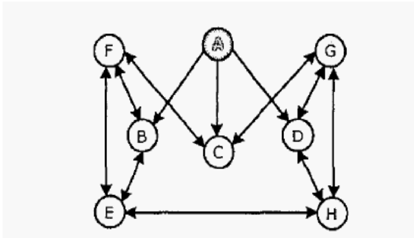

Fig 4: Illustration of partnership in DONet.

The new node can then obtain a list of partner candidates from the deputy, and contacts these candidates to establish its partners in the overlay.

V PEERSTREAMING OPERATIONS

Locating serving peers

The first task that the PeerStreaming client performs is to obtain the IP addresses and the listening ports of a list of neighbor serving peers that hold a complete or partial copy of the serving media. This list is also updated during the media streaming session.

There are in general these approaches that this list can be obtained:
1) from the media server.
2) from one known serving peer.
3) using a distributed hash table (DHT) approach.

Network link: the tcp connection

Most media streaming clients, such as the windows media player or RealPlayer, use the real time transport protocol (RTP), which is carried on top of UDP. The UDP/RTP protocol is chosen for media streaming applications because:

1) The UDP protocol supports IP multicast, which can be efficient in sending media to a set of nodes on an IP multicast enabled network.
2) The UDP protocol does not have any re-transmission or data-rate management functionality. The streaming server and client may implement advanced packet delivery functionality, e.g., forward error correction (FEC), to ensure the timely delivery of media packets.

Peerstreaming requests and replies

The client generates the request and sends it through the outbound TCP connection to a certain serving peer. In network delivery, TCP may bundle the request with prior requests issued to the same peer. If a prior request is lost in transmission, TCP handles the retransmission of the request as well. After the request packet is delivered, it is stored in the TCP receiving buffer of the serving peer. The peer processes the request one at a time. For each request, it reads the requested erasure coded blocks from its disk storage, and sends the requested content back to the client. In case the TCP socket from the serving peer to the client is blocked, i.e., no more bandwidth is available, the serving peer will block until the TCP connection opens up.

VI CONCLUSION

The proposed peerstreaming framework for multimedia distribution service is based on P2P network. The application-level solution build a peer-to-peer (P2P) overlay network out of unicast tunnels across cooperative participating users. P2P media streaming has become a promising approach to broadcast non interactive live media from one source to a large number of receivers. A peer-to-peer

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media streaming system is self growing, server less. Peers are heterogeneous in their out-bound bandwidth contribution to the system. This heterogeneity may be caused either by different access networks connecting the peers, or by different willingness of the peers to contribute.

Proxy caching is an efficient technology for handling network bottlenecks in multimedia distribution systems by caching popular content from origin server to proxy servers located at the edge of Internet. Here the peer can able to share data with a group of other peers and searches for the desired data to neighbors or to directory server. Once the desired data are located, the peer downloads the data directly from the other peer's computer. As the data are selectively replicated among peers, this structure allows sharing of data by a large community at low cost. as dedicated servers are not needed, When a new host arrives it uses a locating method to join a nearest group or form its own group according to the group criterion.

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