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RESEARCH ARTICLE

IMPROVE THE PERFORMANCE OF P2P LIVE STREAMING

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Abstract— *with advent of various mobile devices with powerful networking and computing capabilities, the users' demand to enjoy live video streaming services such as IPTV with mobile devices has been increasing rapidly. However, it is challenging to get over the degradation of service quality due to data loss caused by the handover. Although many handover schemes were proposed at protocol layers below the application layer, they inherently suffer from data loss while the network is being disconnected during the handover. We therefore propose an efficient application-layer handover scheme to support seamless mobility for P2P live streaming. By simulation experiments, we show that the P2P live streaming system with our proposed handover scheme can improve the playback continuity significantly compared to that without our scheme. Also we incorporate multichannel communication in order to improve quality of service in streaming.*

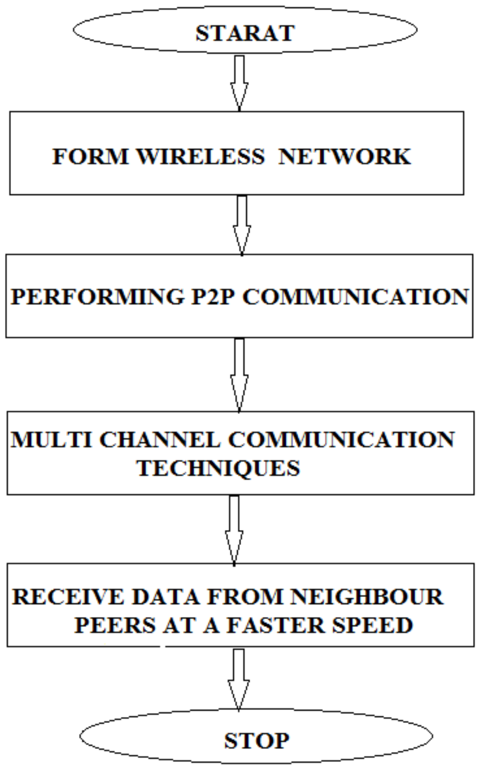
I. INTRODUTION

With the widespread deployment of high speed broadband networks such as FTTH, the IPTV services converging broadcasting and communication technologies have emerged. So far most commercial IPTV systems have employed the client/server architecture where video data are transmitted only from servers to clients. To support a huge number of IPTV subscribers at the same time, however, the client/server architecture should employ CDN (content distribution networks) structures to reduce data transmission delay. As the number of IPTV subscribers an increase, the client/server architecture thus causes high expense for expanding network capacity by adding proxy servers to accommodate all the increasing subscribers .The personalized IPTV services including time-shifted TV may make it even more difficult for IPTV systems to manage network traffic efficiently. Many research efforts have therefore been made on peer-to-peer (P2P) live streaming since it is a cost-effective and scalable alternative to client/server architectures on the Internet. In P2P live streaming systems, peers exchange distributed video data with each other on virtual overlay networks. Thus, the better performance can be achieved as the number of participating peers increases.

On the other hand, with recent advance in wireless networks and advent of powerful mobile devices such as smart phones, the video streaming services have become feasible in mobile platforms. Since these mobile IPTV services can provide users with the mobility and portability in wireless networks, the users' demand to enjoy IPTV services with mobile devices has been increasing rapidly. One of the most challenging issues when designing mobile IPTV systems is that users may experience the degradation of service quality due to data loss caused by the handover occurring when mobile devices are moving across APs. To get over this problem, it is thus essential to provide seamless mobility for P2P live streaming.

II. IMPLEMENTATION PROCEDURE

A. FLOWCHART:



B. DESIGN CONSIDERATIONS FOR SEAMLESS MOBILITY:

We describe several considerations to reflect the characteristics of mobile devices and wireless networks when designing an efficient application-layer handover scheme for P2P live streaming systems.

1. Data Transmission Manners for P2P Live Streaming:

In a mesh-based P2P streaming architecture, the data unit for data delivery and display is a video block. Each video is divided into small blocks, which are distributed to other peers through the mesh structure. Each peer displays video blocks after buffering and sequencing received blocks in memory. Peers periodically exchange their status using buffer maps that represent the blocks' availability in peers' buffers. After obtaining buffer maps from its neighbours, a peer can determine to which neighbour peers it will request missing blocks. In such a mesh-based streaming structure, where data are transmitted in a pull manner, playback should be delayed until a peer can receive the sufficient data to start to playback a video. On the other hand, in a tree-based P2P streaming architecture, peers receive video data from an origin server or parent peers only in a push manner. This structure enables peers to transmit data at a faster speed because they can keep transmitting data without any specific requests from their child peers once the tree structure is constructed. In general, a mobile peer tends to experience Data loss while communicating with others due to unstable wireless network environment. The mesh structure is thus more suitable for mobile P2P streaming architecture since a mobile peer can receive data more stably by requesting the retransmission of lost blocks. However, a peer has the longer delay when receiving data in a pull manner compared to that in a push manner. This is because, in a pull manner, it can receive the desired blocks from neighbour peers by specifically requesting them after exchanging buffer maps. Moreover, since a mobile peer cannot receive any data block during the handover, the transmission delay can be much longer after the handover. In our P2P lives streaming system, a mobile peer therefore receives data in a push manner only for a short period around the handover to receive data at a faster speed.

2. Criteria for Selecting Neighbour Peers for a Mobile Peer:

Even though a mobile peer is not able to receive any data only for a short period due to network condition, especially during the handover, it must continue to playback the video, keeping consuming the data that have been buffered before that period. As a result, a mobile peer may experience playback jitter unless it can quickly obtain the required data as soon as the network is available. To avoid such degradation of playback quality in our P2P live streaming system, we consider the proximity to a mobile peer as the first criterion when selecting neighbour peers. This can reduce the network latency through the shortened transmission route. On the other hand, peers buffer the data corresponding to a specific period around their current playback positions. Since lag times between an origin server and peers are getting large as the number of peers increases, however, peers' buffering periods also become widely distributed. Furthermore, when supporting VCR operations, peers' playback positions become distributed more widely. The other criterion is therefore how much data required by a mobile peer a candidate peer is currently buffering.

3. Handover Prediction:

If a mobile peer cannot receive sufficient data before the handover, they may not be able to continue playing back the video due to lack of buffered data even though they receive the data at a fast speed after the handover. To prevent this situation, it is necessary to receive as much data as possible by predicting the handover before it actually happens. In our P2P live streaming system, we adopt the most common technique using signal strength of APs, that is, RSSI, to predict the handover. In other words, a mobile peer predicts that handover will occur soon when the difference of signal strength between the current and the target AP becomes smaller than the given threshold. Once the handover is predicted, neighbour peers can transmit data to the mobile peer at a faster speed by switching their transmission manner to a push one.

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