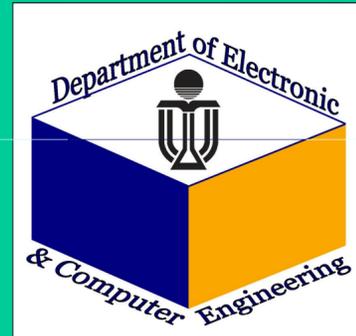


Peer-To-Peer IPTV System over the Internet(TD1a-09)

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Project Overview

Nowadays, the Internet has become part of our life. IPTV is one of the hottest online applications which use the P2P technology. This IPTV project aims to introduce a P2P IPTV with live HD streaming under a scalable system. The greatest challenge of providing HDIPTV is the network speed and stability of clients' internet connection. To solve these problems, our P2P IPTV system applied the hybrid connection model which includes the push mode and pull mode. It achieved a high quality live TV over 1Mbps in multiple broadcast channels under the HK Internet environment.

System Components

Tracker

- Peer registration
- Peer deregistration
- Channels maintenance
- Peer lists maintenance

Video Server

- Sub-streams maintenance
- Video transcoding
- Preview broadcasting video
- Upload stream handle
- System setting

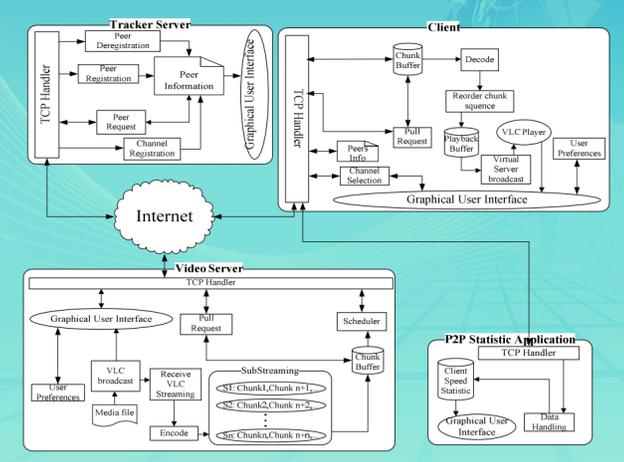
Client Side Application

- Sub-stream reordering
- Missing chunk recovery
- Channels selection
- Upload stream handle
- Playback the video

Statistic Plug-in

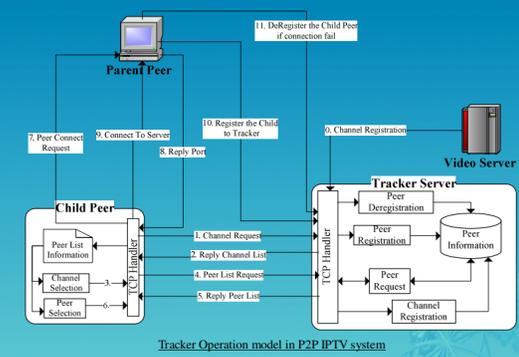
- Display the upload and download speed

Full System Block Diagram



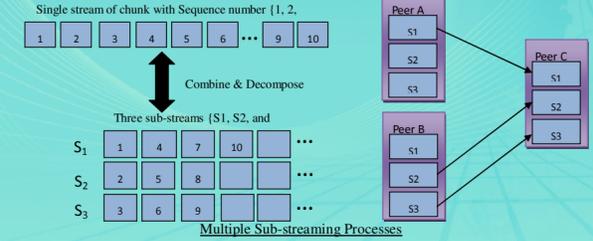
Methodology

Tracker Server
 Tracker is the sub system which dominates the connection establishment processes. Tracker server is a centralized database which maintains complete record of peer information. It maintains the topology of the P2P IPTV network and provides the accurate peers' information to every peer in the topology.



Multiple Sub-Streaming

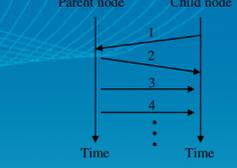
The video stream is divided into different chunks and each chunk is assigned a sequence number to represent its playback sequence in the stream. One of the key factors contributing to the success in P2P file sharing applications is the adoption of the gossip concept, in which a node can request different small chunks of file content from different nodes. This achieves significantly improvement on efficiency compared to other traditional system



Hybrid algorithm

Our P2PIPTV system is developed with hybrid algorithm which is the combination of push algorithm and pull algorithm.

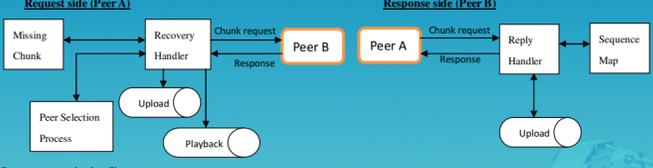
Push Algorithm



Our system using push algorithm as the core chunks delivery algorithm. As shown in the left figure, the parent node will send the latest chunk to the child node continuously until the connection is closed.

Pull Algorithm

Pull algorithm will be applied to perform recovery process while missing chunks are detected.



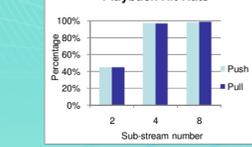
- Steps to request chunk pulling:
- Peer selection Process (e.g. Peer B)
 - Get the sequence number in missing chunk list
 - Chunk request to Peer B
 - Response from Peer B
 - Copy the missing chunk to Upload buffer or Playback buffer
- Steps to response chunk pulling:
- Chunk request from Peer A
 - Search the sequence map
 - Copy the target chunk from upload buffer
 - Send the response to Peer A

Results and statistic

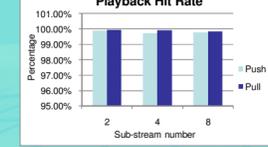
By applying P2P hybrid model, we achieved a live TV playback with low latency and minimized start-up time. The supported streaming bitrates have been dramatically boosted to 1Mbps. Following is some results and statistic found using our system:

Playback hit rate = number of chunk played by VLC / number of chunk received

Test Result with 1500kbps Mp4 video



Test Result with 360kbps Mp4 video



The above results showed that the system can be stabilized by increasing the number of sub-streams. Since the throughput per sub-stream will be lower while the number of sub-stream increases, the network bandwidth requirement and disconnection frequency due to connection time out will be lowered.