

The Design and Implementation of Video Streaming Media System Based on the Mobile P2P Network

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Abstract: Compared with the traditional video streaming media system based on C/S mode, the video streaming media system based on P2P can efficiently solved the problems like single point of failure, high construction cost. Therefore, this study implemented a video streaming media system to provide the video streaming media service of high quality and large capacity. A mobile P2P video streaming media system architecture is firstly presented. Next, the design and implementation on the three modules, including server control program, client service program and client playing program, is introduced in detail. At last, the run results of each module as well are presented.

Keywords: Client/server, peer to peer, R-D model, video streaming media

INTRODUCTION

In recent years, great progress has been achieved for the video streaming media service which acts as the application of the broad band increment service due to the rapidly increased broad band users. With the rapidly popularization of the smart phone, the mobile phone network users are increased sharply. In the network service that internet users frequently used, the online video watching and video download accounts for a considerable proportion, the market scale of the formal operators of online video amounts to billions Yuan. However, the present video streaming media system, such as Windows Media Server, Helix Server are all based on the C/S mode and provide the streaming service for the broad band users with the help of center server group. With the rapidly increase of the video streaming users, the limitations of the video streaming system are revealed increasingly. While compared with the video streaming system based on traditional C/S mode, the video streaming system based on the P2P technology can effectively solve the problem like single point failure, high cost of construction. The server resource and user computer resource of the video streaming system based on the technology P2P can reasonably and simultaneously used. Users provide simultaneously the service for other users by utilizing their idle computer resource when he enjoys the video streaming service. The resource of the video streaming system is not only the server resource, but also including the idle resource of the various users'

computer. Therefore, this study implements the video streaming system which can provide the high video quality and large system capacity.

LITERATURE REVIEW

Currently, there are plenty of theoretical researches on the video streaming media system based on the P2P technology. P2P technology, video streaming playing and transmission technology are relatively mature. Therefore, the recent research is mainly focus on how to improve the quality of video streaming media under the P2P framework. One kind is focus on the research on the Rate-Distortion mode. At present, the R-D mode may roughly divide into three kinds:

- Analytical R-D model (Dai and Loguinov, 2003; Park and Lee, 2004; Dai, 2004; Sun *et al.*, 2005)
- Experimental R-D model (Zhang *et al.*, 2003)
- Hybrid R-D model

Another kind is the optimized QoS technology of video streaming media and this type of optimized technology mainly focus on two aspects including the optimal partition of FGS video sequence (Radha *et al.*, 2001; Van Der Schaar and Radha, 2002; Liu *et al.*, 2003) and receiving peer driven bit allocation (Su and Wang, 2006; Chou and Miao, 2006; Cuetos *et al.*, 2005). For the mobile P2P technology, Cheng *et al* from Taiwan University of science and technology applies the P2P technology into the Ad Hoc network of

mobile Phone and propose the mobile business construction based on the Ad Hoc network of mobile phone and improve the message mechanism for sale mode based on the character of P2P.

MOBILE P2P NETWORKS ARCHITECTURE FOR VIDEO STREAMING MEDIA

The architecture for mobile P2P streaming media systems employs the framework of the super-unstructured P2P architecture. The framework divides all peers into two or more layers by their comprehensive capacity. The peers with strong power become super-peers and the other peers become leaf peers. Each leaf peer is connected to an adjacent super-peer and each super-peer connects some leaf peers and some other super-peers. The information of shared files is only saved in super-peers. This architecture integrates several merits, such as the high efficiency of centralized search, autonomy, load balance and robustness of decentralized search. At the same time, it makes full use of the difference of peers' capacity. However, unlike the cable network, the mobile P2P network cannot directly employ the present P2P architecture. The operation of a mobile P2P network is controlled by its operator and

the network model for P2P application must be controllable. Hence, based on the super-unstructured P2P network, all peers in the architecture are factitiously classified into two categories: General Super-Peers (GSP) and the Special Super-Peers (SSP) controlled by the mobile-network operator. A general fixed peer is connected to a GSP and a mobile device is connected to an SSP. As a consequence, the original super-unstructured P2P architecture needs little change. Only the peers controlled by the mobile-network operator may join the system and become super-peers. The original fixed peers are not affected. Figure 1 shows the mobile P2P network architecture.

The client's main operations under this system include:

- The users divide and number the shared video resources. Next, they send the data information package by IP multicast (the information includes host number, port address, communication port and *et al.*)
- Resource interactions with other client

Main functions of backstage management system include:

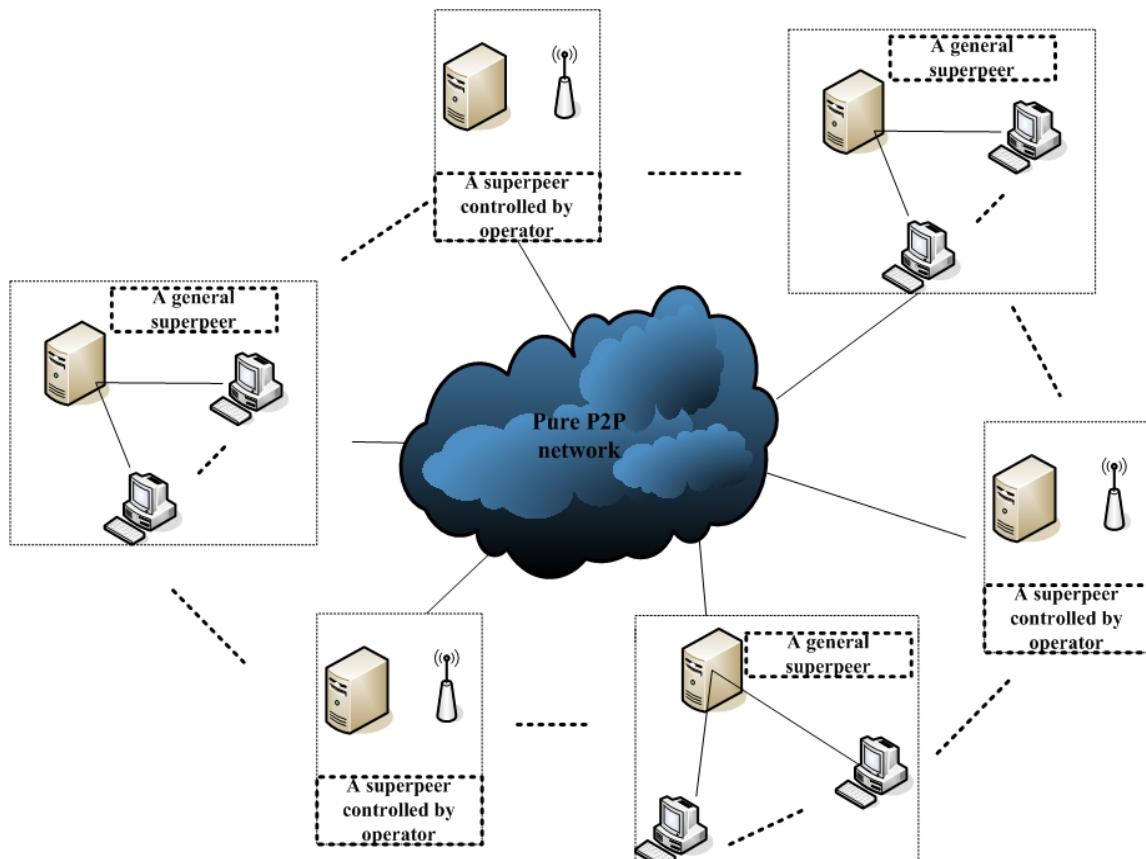


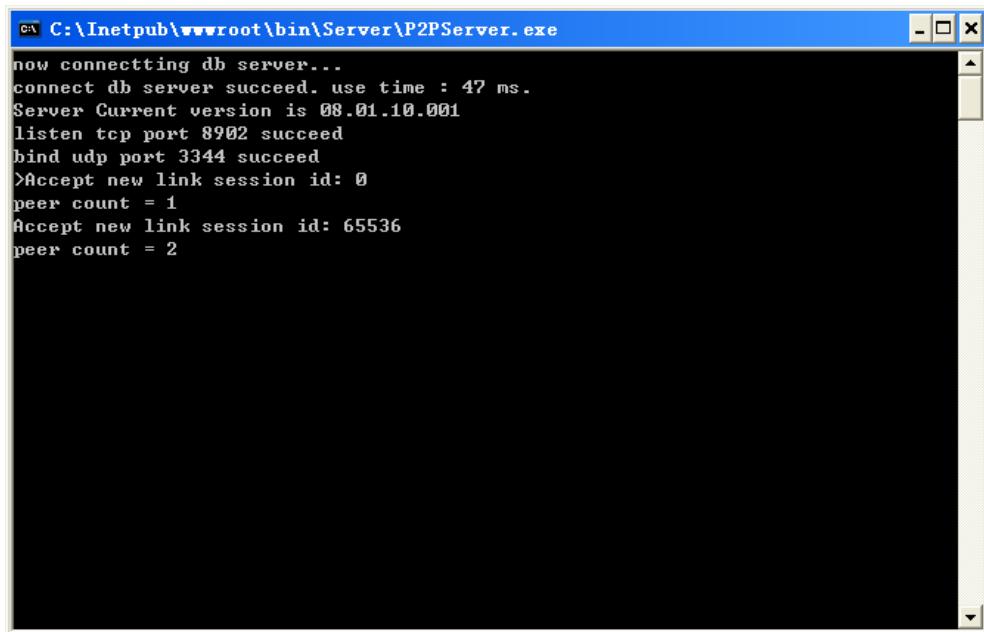
Fig. 1: The architecture for mobile P2P networks

- Flow generation:** The server compresses the video flow into certain number of layers to meet the client's heterogeneity and suppose every layer's broad band is fixed. The server marked the group of generated data as active group and transmits them to the child node by IP protocol.
- Session control:** During the session, the server accepts the ordered group from the active node or the client. Next, the server registers them as the child node and records the information layer's number that they ordered. During the video streaming session, the server accepts the feedback

group from the child node. These groups include the layers' number that child node wish to order and server would adjust the layer's number according to the corresponding child node.

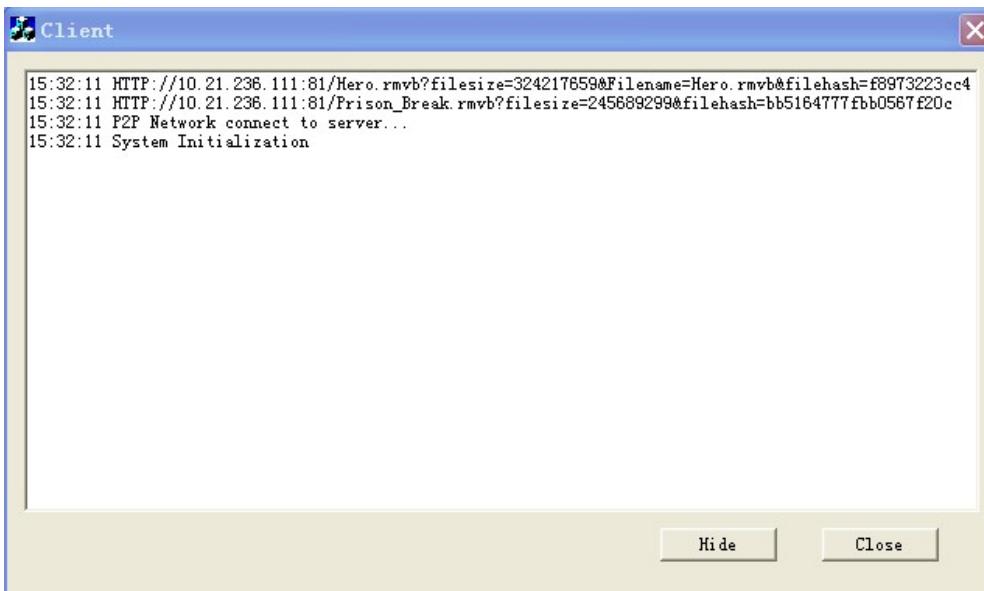
SYSTEM DESIGN AND IMPLEMENTATION

This system includes three sub-systems, server control program, client service program and client playing program. The design and implementation of three sub-systems are elaborated in the following:



```
C:\Inetpub\wwwroot\bin\Server\P2PServer.exe
now connectting db server...
connect db server succeed. use time : 47 ms.
Server Current version is 08.01.10.001
listen tcp port 8902 succeed
bind udp port 3344 succeed
>Accept new link session id: 0
peer count = 1
Accept new link session id: 65536
peer count = 2
```

Fig. 2: The run interface of server control program



```
Client
15:32:11 HTTP://10.21.236.111:81/Hero.rmvb?filesize=324217659&filename=Hero.rmvb&filehash=f8973223cc4
15:32:11 HTTP://10.21.236.111:81/Prison_Break.rmvb?filesize=245689299&filehash=bb5164777fbb0567f20c
15:32:11 P2P Network connect to server...
15:32:11 System Initialization
```

Fig. 3: The client-side server program

The server-side control program: System manager possess the login password for video streaming server and can accessing the desk of video streaming server remotely. He has authority of classification and edition of video except all of the operator's authorities. Operators can upload bulks of various video resources, upload the video, delete or modify the video information, upload the picture, delete, handle the user reflected information etc. The Fig. 2 shows the run interface of the server control program.

The client-side server program: The client-side server program is the bridge for P2P video streaming service and client, each client complete the upload and download function with the help of service program. The Fig. 3 shows the run interface of client-side server program.

In the client-side server program, video quality is often influenced by the network delay and dithering, which cause several problems like delay and disorder in the received data package. In order to solve these problems, most current popular video streaming players set the cache to make up the influence that caused by delay and dithering of network. Furthermore, they also process the disorder problem of the data package to make the cached data played in continuous order and protect the picture from pause and crash. The caches in client-side serve program stores the data package with circular queue and employ First in First out (FIFO) strategy to handle the cache data package. The front end read the cached data in decoding rate of the video decoder; the back end stored the video frame that received in the cache according to the actual arrived data rate and discard the content that already played for give the content that not played more room. In the

```
Program:Hero.rmvb
The number of online person: 10
User ID:56
IP ADDR: 10.21.236.111:4393
Download Speed: 129KB/s
Owned Size: 23.53MB
Upload Speed: 12KB/s
Press any key to continue
```

Fig. 4: The video information extracted from the playing video

process of client, press F1 any time, you can find some information of current played video streaming file in the terminal, including the information like the size of video streaming media, IP address, played rate, download speed etc. The Fig. 4 gives an example.

Client playing program: To watch the video, users click the specific film links in the website of streaming media server, or type the URL in address bar of player control interface. By the requested player type, the Master control module requests and loads the corresponding video play program: online play program or local play program.

After the play subsystem builds the playing session, it receives the network data or reads the data from the local file, resolve, verification, cache, synchronization and submit video data. After master control module gets the data from data resource module, it would judge the type of the media data is audio data or video data. Next, it decodes and restores the data with the help of corresponding decoding module. Last, it returns the media data that

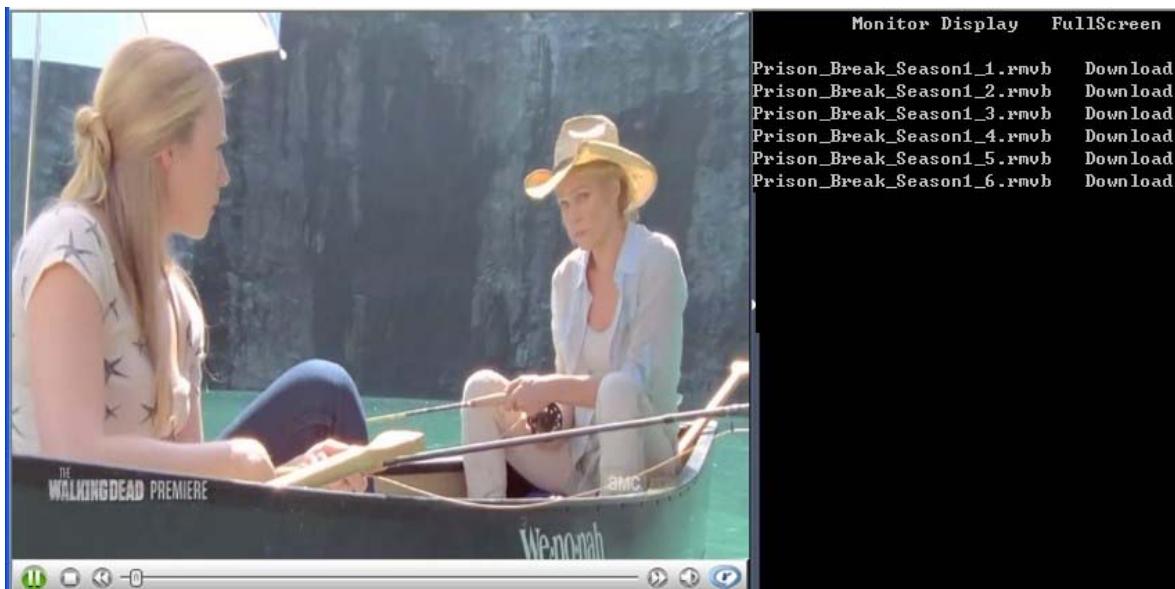


Fig. 5: The client player program

can directly be played to master control module. Master control module invokes the corresponding play module to play the data according to the media data type. The server also accepts the feedback group from the child node, these groups including layer numbers that child node wish to order. And the server will adjust the data layer number according to the corresponding child node. The run interface of client player program is shown in Fig. 5.

CONCLUSION

Compared with the traditional video streaming media system based on C/S mode, the video streaming media system based on P2P can efficiently solved the problems like single point of failure, high construction cost. The server resource and user computer resource of the video streaming system based on the technology P2P can reasonably and simultaneously used. Users provide simultaneously the service for other users by utilizing their idle computer resource when he enjoys the video streaming service. The resource of the video streaming system is not only the server resource, but also including the idle resource of the various users' computer. Therefore, this study implements the video streaming system which can provide the high video quality and large system capacity. A mobile P2P video streaming media system architecture is firstly presented. Next, the design and implementation on the three modules, including server control program, client service program and client playing program, is introduced in detail. At last, the run results of each module as well are presented.

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