Streaming Media Technology in the Digital Library Information Transmission

Li-fang Zhao[+]

Shandong University of Technology

Zibo, Shandong, 255049, China

Abstract: Streaming media technology, a new type of media transmission under the network environment, has wide prospects. This paper probes the basic principles, systematic component and agreement about streaming media, the utilization, especially in the digital library, is introduced in detail.

Keywords: MPLS; Streaming media; Agreement; Network; Digital library; Information transmission.

1. Introduction

In the information age, we are faced with huge amounts of information. What's more, ways of information presentation are getting diverse. More information will be published and disseminated using audio, video and other multimedia technology. Some multimedia applications (such as video conferencing, distance learning and digital library, and so on) are immerging. If we want to obtain these kinds of multimedia information, it is necessary that we have access to the network to transfer and obtain this information. Streaming media technology was put into use in this background, and gets fast development. Streaming media service will become the main business of the high speed Internet in the future.

2. Streaming technology

2.1. The concept of streaming media

Streaming media refers to the continuous time base media using streaming technology in the Internet. The key to the realization of streaming media technology is streaming transmission. Video, voice and data transit through the real-time Transport Protocol from source to destination in the mode of in-order continuous flow. Once the destination receives and caches a certain amount of data, the multimedia can be immediately played. Compared to the traditional way of downloading the multimedia, streaming media has the following advantages.

(1) Waiting time can be greatly reduced because not all the data needs to be downloaded;

(2) since the data amount of the streaming file is often less than that in the original file, and users do not need to download all the streaming file to their hard disk, this can save large amounts of disk space;

(3) Thanks to the real-time Transport Protocol Rstp, the streaming media is more suitable for video, audio, real-time information on the Internet.

2.2. Systematic component of streaming media

A complete streaming media system should include the following components.

[+] Corresponding author.
 E-mail address: zhaolifang@sdut.edu.cn

Media Encoder: to create, capture and edit multimedia data, and to form the streaming media format. The media encoder can change the original files of image and media to real-time media data which is a network-based file format (stream format), and then store the streaming file in the media file storage, or sent directly to the streaming media server.

Media file storage and streaming media data: the stream media data is stored in a stream format, generally using a SCSI hard disk or a disk array.

Transport network: the network which is suitable for Media Transfer Protocol or real-time Transport Protocol.

Media Server: to control the data transfer of streaming media. That is, to response to the requests of the users transmitted from a Web server by the scheduling server, and to send the stream format file to the user's desktop through a network transport protocol.

Media Player: to receive network media data and play locally, to browse the streaming media file in the user-end.

Streaming media Player: unicast, a separate data path needs to be set up between the client and the media server, and each packet can only be delivered to a client computer from one server, this is what is called unicast delivery. Multicast, IP multicast technology can construct a multicast network, and allows the router to copy one packet to multiple channels. Using multicast mode, a single-server can send a continuous data stream to hundreds of thousands of clients at the same time without time-delay. Thus, the multicast technology can reduce the number of packets in the network and allows for greater network efficiency and lower cost.

2.3.   The theory of streaming media

As noted earlier, the so-called stream media refers to the consecutive time-based media data in the Internet and other networks using streaming transmission. To achieve streaming media, the technology of streaming transmission is significant, that is, it is important to obtain a smooth flow of data through the network. In order to achieve streaming transmission, a number of technical means should be taken.

Nowadays the storage capacity and the bandwidth of network can not fully meet the requirements of the large date amount of the multimedia data flow. Thus, the multimedia data needs to be processed before storage or transport. There are mainly two ways of pretreatment: the use of modern and efficient compression algorithm, and to reduce the quality (loss compression). Similarly, in streaming media technology, multimedia data should first undergo a special compression, and be divided into packets before streaming transmission, then it can be sent to the users'computers by the server continuously and in real-time.

In addition, compared with downloading, streaming has significantly lower requirements for storage capacity of the system, but it still needs the cache. This is because the statistical time-division multiplexing is based on packet transmission through the Internet, data will be broken down into a number of groups during the transfer process, and the network uses connectionless mode. Because the network is dynamic and different groups may choose different routings, different groups of data may arrive at the user's computer in different path and with different time delay. Therefore, cache mechanism must be used to make up for the delay and delay variation, so that the media data can be output continuously and won't pause as a result of network congestion. The cache uses the ring linked list to store data. By discarding the contents that have been played, one can reuse the cache space to cache subsequent media content.

If the Terminal communicates by a connectionless way (such as UDP/IP) and if the data packet should be transmitted in the correct order, under the premise that the network quality is guaranteed, the caching mechanism is a basic problem in the streaming media technology. In order to provide better QoS in IP network, several mature bandwidth adaptation and quality control techniques have been developed in the stream media field. Intelligent Streaming: the so-called intelligent streaming technology is that the system can automatically detect the network condition, and will adjust the video and audio data flow, so that the users receive their media streams whose quality matches with the connection speed and the users can get the best using experience. The essence of the intelligent streaming is to detect the changes in network bandwidth through rate feedback mechanism in the c/S application layer, and to dynamically adjust the media stream

transfer rate in the server by the multi-velocity encoding capability of the media streams, and to guarantee the user can receive good media streams while the user's network bandwidth varies. Splitting technology: split is often used in live web casting. The sending server uses UDP unicast and UDP multicast to send the live broadcast media streams to the receiving server elsewhere. The client may access to the nearest server for high-quality media streams, while the usage of the bandwidth is reduced.

There are two ways to carry out streaming transmission: real-time streaming and progressive streaming. Progressive streaming is to download in sequential order, and is not suitable for long-time video and random access requirements of the video, such as: lectures, speeches and presentations. Real-time streaming media guarantees the match of the signal bandwidth with the network connection, so that the media can be viewed in real time. The real time streaming needs a special streaming media server and the transport protocol.

2.4.   Network protocols supporting for streaming delivery

The streaming transmission needs the appropriate transport protocol. Streaming media is transferred by Streaming transmission mode between the network server and the clients.

RTP/RTCP: RTP (Real-time Transport Protocol) provides an end-to-end transfer service of real-time featured data like interactive audio and video. If the underlying network supports multicast, RTP multicast may also be used to send data to more than one endpoint. RTP contains two closely related parts, that is, RTP which is responsible for shipping real-time multimedia data, and RTCP which is responsible for the feedback control, monitoring QoS and the delivery of related information. It can assign bandwidth resources based on the QoS requirements of data and based on the management strategy of bandwidth resources, and provide a complete path in the IP network. By constructing the path from the sender to the receiving end through the reserved network resources, it is possible for IP network to provide business that has the quality as high as that of the circuit-switched business.

RTSP real time streaming protocol: real time streaming protocol (RTSP) is an application-level protocol used to control the transfer of data with real-time characteristics. It provides an extensible framework to control and deliver real-time data on-demand, such as audio, video, and so on. The data source can be either a device that produces real-time data or a media file saved in advance.

RSVP resource booking Protocol: RSVP (resource reserve protocol) is a resource booking Protocol under development on the Internet. By using the RSVP to reserve part of the network resources (bandwidth), QoS can be provided for streaming media transport.

MIME protocol: General Internet mail extension MIME (Multipurpose Internet Mail Extensions) is an extension of SMTP, which is not only for e-mail messages, but also for tagging any transmitted file type on the Internet. Through it, the Web server and a Web browser can identify the streaming media and process it.

3. The application of streaming media technology

The rapid development and increasing popularity of the Internet provides a large market for the development of streaming media business. Streaming media service is becoming increasingly popular. It is widely used in multimedia, digital libraries, e-commerce, video on demand, distance education, telemedicine, real-time video conferencing, and the other applications of Internet services. It will be bringing revolutionary change for the exchange of network information, and will have far-reaching influences on people's work and life. The following describes some typical applications of streaming media.

3.1.   The digital library

The digital library is the digital resource database of the large number of structured information, and is an advanced information system which is constructed by the software and Internet. The ultimate goal of the digital library is to let people have access to all human knowledge at any time, in any place through any digital equipment which is connected to the Internet. The digital library is a broadband multimedia network and a management system of massive information. The storage objects and technical disciplines extend far beyond the scope of the present traditional library. The storage objects include a wide range of data of arts and science, like digital books, audio and video, news, art, photographs, sculpture, movies, software, electronic

publications, Internet content, satellite data, meteorological data, geographic data, and government documents. Thus, it involves a large amount of issues in storage, transfer, and management. As the digital library involves diverse fields of technologies, it needs a lot of technological breakthrough to support. By using streaming media technology, multimedia information can be searched and transmitted intelligently, individually and automatically, so that the potential of the digital library can be realized.

3.2. In recent years the construction of the campus intranet

In recent years the construction of the campus intranet is flourishing, especially the construction of the high quality platform of network hardware in the universities. With the development of multimedia technologies, especially the breakthrough of the streaming delivery technology, the online multimedia class is realized. Now there are many mature products, such as the IP/TV of Cisco, which can be used to the construct the campus video network, and to provide three communication modes including live broadcast, timing broadcast, and video on demand. With the combination of a digital library and the campus intranet, the visual, audio, electronic publications of the library and other information can be transmitted through campus video online using the streaming media technology.

3.3. The real-time video conferencing and video-on-demand

As the popularity of the internet increases, the information transmitted through the network is not limited to text and graphics. There are lots of internet videos-on-demand nowadays; they need to achieve the publicity and advertising purpose like what the TV does by letting a wide range of audiences have access to the high-quality programs, and they need to satisfy the needs of the audience. This requires the system to have the features like a high transfer rate, data synchronization, data flows, triage and high stability. The best solution of video and audio transmission though internet is streaming media transports.

3.4. Distance education

In the era of knowledge-based economy, the online education creates and provides access to learning when the sources of information and the learners are separated by time and distance, and breaks down the traditional "face-to-face" limitation in teaching. Technically, distance education system is the application of the modern multimedia technology. It is through the modern communications network that the images, voices of the teachers are delivered to students, and that the images, voices of the students are feed back to the teachers, thus to simulate the way of school education. To make a summary, modern distance learning system needs to achieve teaching software VOD (video-on-demand), live-broadcast, online class, and other functions. To develop distance education in the network, the transmission of the audio and video streaming should be in a synchronous manner, as well as the other data and the video, audio information. As a result of the wide bandwidth of audio, video information, it is not possible to let students download all of the programs to their local computer and then play the programs. Thus it is necessary to use the advanced streaming media technology to sent and play in the same time.

4. Conclusion

Media Services system is different from network file service system. The streaming media Web services system and traditional network file service system share a lot of similarities when they are implementing their functions, particularly on the shared use of the data and the pursuit of maximum data throughput. However, the streaming media stresses more on high speed, stability and continuous access to the stream support, and emphasizes on the support for synchronization。 Due to the limitation of the network bandwidth and network speed in our times, it has been unable to fully extend the power of streaming media technology. This is to say that the streaming media services systems will greatly prompt the development of the computer's hardware and software design.

Streaming media technology will become one of the driving forces for the growth of the next generation Internet. With the streaming media technology becoming better day by day, as well as the need for the streaming media booms, streaming media technology, the content storage technology and management of streaming media, the streaming media terminals, and digital security are all developing. Streaming media

service will become main business for information in the network. Streaming media technology will certainly become better and well developed.

5. References

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