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THE OVERVIEW AND APPLIANCE OF SOME STREAMING VIDEO SOFTWARE SOLUTIONS



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The Overview and Appliance of some Streaming Video software solutions

This paper introduces the basic streaming media technology, the streaming media system structure, principles of streaming media technology; streaming media file formats and so on. After that, it discusses the use streaming media in distance education, broadband video on demand, Internet broadcasting, video conferences and a more detailed exposition in streaming media. As the existing technology has been unable to satisfy the increasing needs of the Internet users, the streaming media technology is a technology which can satisfy those needs in many fields. Finally, this paper discusses the applications of streaming media technology and their prospects.

KEYWORDS: Streaming, Stream, Format, Encapsulation.

FOREWORD

I want to thank to my supervisor Väänänen Ossi, who he spared his time to help me completed this thesis. I want to thank to my teachers who teach me a lot in this area.

Special thanks are reserved for my family and friends for their support.

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Turku, March 5th, 2010

Qin Yan

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TABLES

NOTATION

On-Demand	,A type of streaming in which a clip plays from start to end when a user clicks this link. Most clips are streamed in this way.
Live	Live streams are only available at one particular time, as in a video stream of a live sporting event.
Buffering	Receiving and storing data before playing.
Codec	A codec is a device or computer program capable of encoding and/or decoding a digital data stream or signal . The word codec is a portmanteau of 'compressor-decompressor' or, most commonly, 'coder-decoder'.
Encoding	Converting a file into a compressed, streaming format.
Multicast	Multicast is a node in the network message received by multiple nodes in contrast to Unicast which refers to a node in the message received only by a one node, which is a node in the message received by all nodes within the subnet.

1. Introduction

Streaming media is the way of streaming media formats in the Internet broadcast. It is the process of transmitting video data packets from the server to the end user. The end user can extract these data with streaming media in order to watch the video.

Streaming Media refers to data transmission over the Internet which is played according to the time and the order of the continuous audio / video data stream, that is, live transmission. In the past, when people wanted to watch movies or listen to music, on the Internet they had to first download the entire audio file and store it on the local computer and then they could watch it.

Streaming media applications include: video on demand (VOD), video broadcasting, video surveillance, and video conferencing, distance learning, and interactive games. As the speed of the Internet connection is slower than the speed of the video clip, buffering is used to prevent interruption of the video clip and maintain the playback quality..

The streaming mode refers to the process of compressing the entire audio/visual (A / V) and 3D and other multimedia files into a package one by one, and transmitting it from the video server to the user's computer, continuously and live. As mentioned before in the past end users had to download the entire file before they could watch the A/V file. However with the streaming mode there is a delay of only a few seconds or tens of seconds after the start. During this time the user's computer equipment (hardware or software) decompresses the compressed A/V, 3D or other multimedia file for playback and viewing. So the video starts playing and at the same time the remaining part of the multimedia file continues to download in the background.

2. Definitions

The flow is the transmission of a series of related packets. When we actually refer to streaming media, we mean is new media transmission, rather than new media. With a full application of streaming media technology, people can chat online with direct voice input; if the users want to see each other's appearance and facial expressions, as long as both ends (sender and receiver) have a camera on their computer, they can actually see each other with the click of a button..

Streaming media is used to transfer a stable and continuous stream of data. Streaming media technology and the development of the Internet are used widely, as more and more people have a fast and adequate access to bandwidth.

During the workflow, the client receives data packets, the data packets must be collected, and then sent in a steady stream of application data which will be converted into sound and pictures. The client receives data packets faster than necessary; therefore, they must be stored in a buffer. If the data can not come fast enough, this means that the flow will not be smooth.

As more and more streaming technologies appear, there is plenty competition. For audio data on the Internet, the realtime standard is Progressive Network's RealAudio.

2.1 True Streaming and Pseudo Streaming

In the previous section, realtime streaming was introduced. However, there are other streaming methods such as pseudo-streaming or progressive download. In this streaming method, the end-users will have to wait until a large part of the contents of the media file has been downloaded to their hard drive before they are able to view it. This allows viewers to save the file to their computer, if they want to complete downloading the entire file later. Therefore, the real streaming media is a good transmission method for longer media clips.

2.2 Source Material in the Streaming

Either live or prerecorded source material can be streamed. For live source material, viewers can visit the web site to watch and listen to a live broadcast. However, today most streaming applications use pre-recorded material. This method gives distribution of on-demand media to any person in any country.

3. Techniques

3.1 Working theory of Streaming

Here are all the components that work together to make streaming media happen on the web (See Figure 3.1).

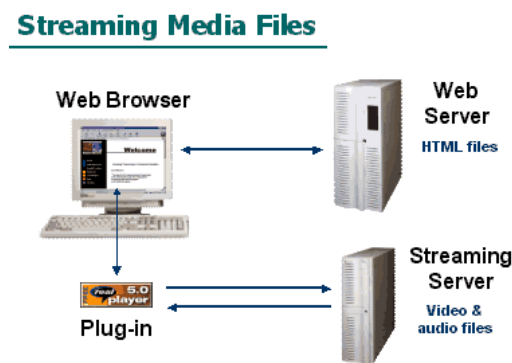


Figure 3.1. Streaming Media Components [1]

The first time, a user connects to the Internet, he needs to install a web browser which is the site for free download of media player or plug-ins. The plug-in will work together with the web browser-specific format of these encoded files. Web pages and HTML files will be stored in the Web server. Typically, this type of file always resides in a separate server. When a user clicks the link of a video file and the media browser reads the HTML code and then the player or the plug-in will take over it. Subsequently, the player will buffer media files, and then the video file will start on the the user's screen.[1]

3.2 Delivery methods in streaming media

3.2.1 Delivery Methods

There are two main ways that users can access and experience media:

The first one is Video-on-Demand: A video or film is a type of service allowing viewers to immediately access media files, such as a television program on the Internet for free or pay-per-charge. Users can fast-forward, rewind, or pause the clip and the media server will start at the right part. This type of editing is pre-recorded or pre-installed.

The second delivery method is Live. It is only for a specific time: An example of live streaming is a sports event live video stream. Users can watch and listen to the action at a specific time. It is worth noting that the user can not fast forward or rewind through the clip, because the incident takes place in real time. Of course, the media server can broadcast a live event as quickly and as realtime as the time it takes the hardware and the software to capture the content and convert it to a media format. [10]

3.2.2 Choosing a Delivery Method

So far, two streaming delivery methods have been introduced. The next section discusses the advantages and limitations of these methods in detail. .

- 1- Video-On-Demand: It is the delivery of pre-recorded segments, or stream, to the user's request. Users click on a folder link to watch on-demand clips from the beginning. Users can fast-forward, rewind, or pause clip.
2. Live Video. Live Video is different from VideoOn-Demand, because there are three ways to deliver the clip: unicasting, splitting, or multicasting.
 - (1) Unicasting: This is the simplest and most commonly used method, because it requires little or no configuration.
 - (2) Splitting: In splitting, a media server can share live videos with other streaming media servers. Other clients connect to the realtime server,

known as the separator, which is not the original local streaming server. Splitting reduces traffic load on the source media server which enables the simultaneous distribution of other radio programs.

- (3) Multicasting: Multicasting is a network introducing a standardized method to the user.

3.3 Different Streaming Technologies

In the same way as there are different brands of automobiles, there are different types of streaming technologies. The three major streaming technologies are Real Media, QuickTime, and Windows Media.

Each of these three streaming technologies has its own dedicated server and media type files. The Real Media, QuickTime, and Windows media servers have their own design of the corresponding stream file format of choice. Therefore, the media files will need to create a specific file server that matches the format requirements.

The player is a plug-in web browser component. It is sometimes included in the free part of the browser or it can be obtained via downloading. In other words, users need to install the streaming media player, the player on their computer. Some media players also have a patent. For example, a QuickTime Player or Windows Media Player is not the normal real-time streaming media file.

When using streaming media technology, the audio and video files use an appropriate format, but different file formats need different player software which is called "a key to every lock." At present, the use of streaming media technology, audio and video files is divided into three main "schools", as already mentioned.

3.3.1 QuickTime

QuickTime is combined with Mac OS X that is an optional component installed on an earlier version in Mac OS. All Apple systems have already installed QuickTime. QuickTime can be downloaded in the Windows system either as a stand-alone installation in the website or bundled with iTunes.

Recently, QuickTime has been developing rapidly. Upto date, QuickTime 7 is the latest version of Quick Time. QuickTime 7, along with Mac OS X Leopard and Windows, is a major release, and includes the following new features.[5]

- H.264 video which has ultra efficient new codec delivery, and stunning quality at remarkably low data rates from 3G to iChat AV to HD.
- Multichannel audio playback which has a full experience and surround sound audio playback with QuickTime 7 Player.
- Live resize. QuickTime 7 has fluid playback which can change according to the size of your player screen giving the viewers a clear image.
- New playback capabilities. The viewer can adjust the playback settings on a DVD player or VCR with the new shuttle and playback speed control panel.
- Zero configuration streaming. QuickTime 7 offers an effortless streaming experience from automatically determining the viewer connection speed to ensure the highest-quality content stream possible. If the connection to a stream is lost, QuickTime 7 can even re-establish the connection at the same time.
- QuickTime is a leading cross-platform multimedia technology. More than 10 million video clips every month are downloaded with QuickTime. More than 20,000 applications and content CDs include hundreds of monthly QuickTime permits. In addition, more than 200 models of digital cameras use QuickTime to capture or display their files.

3.3.2 Real Media

As the popularity of the Internet has soared, Real Media has emerged. This file format has become almost synonymous with Internet streaming media. RA, and RMA, both Real Media file types, are inside the audio side. Real Media is the invention of Real Networks Inc. (<http://www.realnetworks.com>) and its main characteristic is the use of very low bandwidth (as low as 28.8kbps) to provide good enough quality so that users can listen to files online. This feature is simply the Internet's early Gospel. After Real Media was launched, the related applications such as Internet radio, online learning, online demand and so on form a new industry.[6]

Internet streaming media is very simple; it simply is the original audio file that is separated into small data packets with a continuous sequence tag. These small data packets pass through the network. When the data packets are received, then they are re-organized according to the order of the audio file. If the network is of poor quality, some packets become delayed or not received. In this case the server skips the data packet to ensure that the user can listen to the file continuously.

Real Media is very poor because the sound quality is low, or even worse than the mp3 player. Especially for a long period of time Real Networks Real Media added only a variety of new features such as ad insertions, ignoring the fact that the speed of the connection and the quality of the media files should be improved. Real Networks collaborates with SONY Corporation, using SONY's ATRAC technology to achieve high-fidelity high-bit rate compression, but these measures still have to resolve the problems discussed above. Real Media's use of online listening is not suitable for editing and there are not many corresponding processing software. Some mainstream software applications support Real Media's read / write, but direct editing can only be achieved with Real Networks' Real Media Encoder in the Real Media Editor. Still, the function is very limited. This is quite similar to the current Windows Media which is very different.[6]

3.3.3 Windows Media

Microsoft launched Windows Media to compete with Real Media and also claimed that other audio compression technologies do not provide direct support. However, Microsoft did not provide full support until it launched its Windows XP version.

Windows Media is also a network of streaming media technology. In essence, it is the same as Real Media. However, Real Media is a limited open technology, using the RTSP (Real Time Stream Protocol) network protocol that is submitted to the Network Working Group RFC (. RFC2326), but Windows Media will not disclose any technical details, allegedly in order to maintain copyright protection as it created the MMS (Multi-Media Streaming) transport protocol.

The following section introduces the Windows Media Player. Until now, more and more people choose Windows Media Player as their main streaming tool.[7]

3.4 Windows Media Player

Streaming media have a large market, and many firms compete for a share of this market. In the recent years, Microsoft has also engaged in this fierce competition. This Windows Media technology is convenient, advanced, integrated, low cost and has gradually been recognized. Microsoft Windows Media is a successful product demonstrating the extensive use of streaming media. Microsoft launched a comprehensive set of streaming media production and publishing and broadcast products. Windows Media server products can be installed, and integrated in the Windows 2000 server. Windows Media products are a major feature of the production, distribution and playback Windows NT software which are integrated, without additional purchase. Microsoft's streaming video solution in the Microsoft Windows platform is free for its customers and the Windows Media have pretty good audio quality, and are easy to use. However, realtime network solutions and products are still lagging behind compared to Quick Time audio software, and they can only be used on the Microsoft Windows platform (except the players). Windows Media services can be used in asf, wma, MP3, wav, format to provide multimedia content for a large number of customers. As a result of the use of streaming, after each customer has received the contents of the media file, he can enjoy it at the same time without having to first download the program content. The flow can significantly reduce the customer's waiting time and storage requirements, at the same time, it also allows the wireless length of the media file, as well as live.[7]

The next sessions describe the Windows Media Player.

3.4.1 Windows Media format

Windows Media technology divides Audio Video Interleaved into two parts, one is Windows Video (WMV), and other one is Windows Audio (WMA),. Windows Media Audio/Video 8, is the latest version, developed from Windows Media format 7. The following paragraphs describe Windows Media format 7.

Windows Media format 7 is a high-quality, high security media format and can be used in the form of media PC, set-top boxes, portable devices and integrated digital media player format. It consists of three parts: encoders, digital rights management systems.

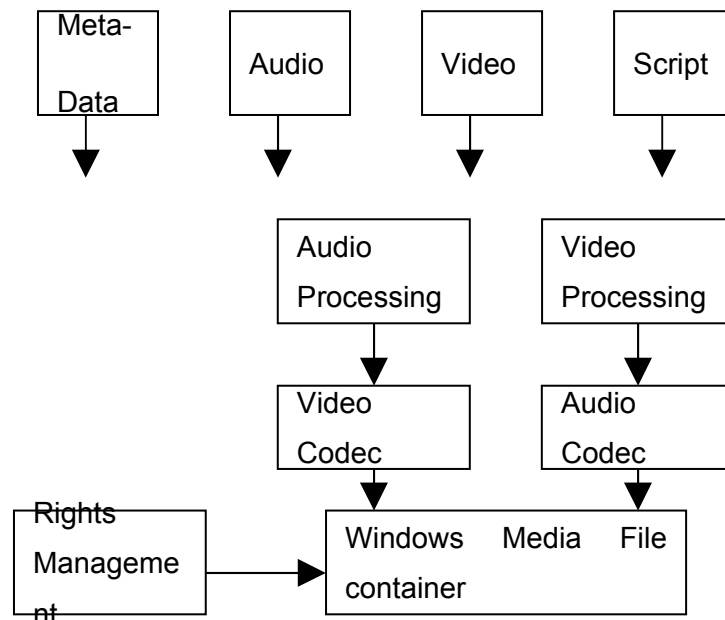


Chart 3.4.1 Overall structure of the Windows Media format 7

Following the development of technology, Microsoft changed the format to ASF. Microsoft defined ASF as a unification of synchronous media container file format. ASF is a data format for audio, video, images, scripts and other commands and it controls multimedia information. The largest advantage of the ASF format is its small size, so it is suitable for network transmission. The user can combine graphics, sound and animation data into an ASF format, and, of course, other formats can convert video and audio to the ASF format, and the user can also use peripheral data saved as ASF format. In addition, the ASF format can be coded.

ASF is part of the audio format and the method is WMA encoding. Actually, the Window Media server also can send the streaming WMA file. However, because other

audio and video encoding transmissions are not optimized on the network, they are rarely applied to the ASF format. [15]

3.4.2 ASF features

Extensible media types: The ASF file allows the user to define new media types easily and provide a very effective and flexible definition of new types of media streams which conform to the ASF file format definition.

Component download: It can put some stream-specific information in the file header. This information can not be found in some versions , if the client has not installed the component download.

Scalable media types: These can provide information for clients to interpret scalability options.

Multiple languages: ASF can support multiple languages; The media stream can choose the language in which the media is contained. This function is similar to streaming audio and text.

Bibliographic information: ASF can provide the function of expanding information with very good scalability and flexibility. This function can not only be used in the whole file but also in single streaming. [15]

3.4.3 ASF file format

The basic unit of the organization is called ASF object. There are three units combined in this file format, the first one is the 128 object size, the second one is the 64 object size, and the third one is the object data. The value of the object size is the size of the object plus 24 bytes of data. The following figure shows the ASF object.

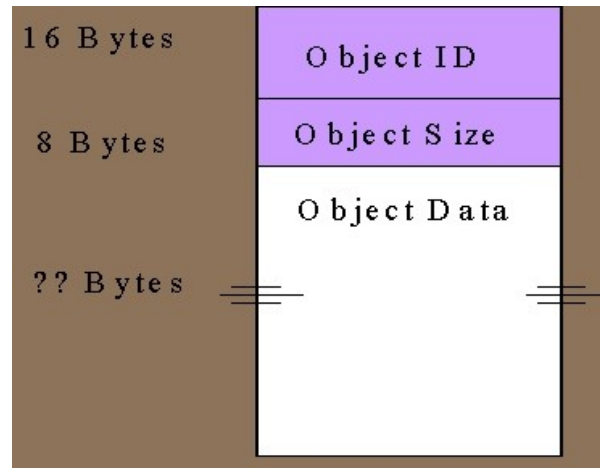


Figure 3.4.3.1. ASF object size

The ASF file organization is a high level file organization. There are three object levels. The first one is the header object, the second one is the data object, and third one is the index object. The header object is necessary, and must be placed in each ASF file header. The data object also necessary and it should placed after the header object. The index object is optional, but it is recommended to use it.

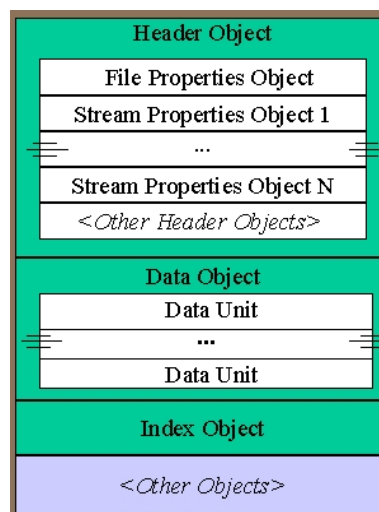


Figure 3.4.3.2. Three object levels

It is a prerequisite for the ASF data object to have received the header object. The header object is reached before the data object in three ways:

- The information contains the header object as a part of the “Session Announcement”.
- The object and the data use a different “channel” to send the header object.

- The ASF data object is sent before the header object.

In the three object level, the header object is the only one that can contain the other ASF objects. The ASF head object can contain the:

- File properties object: This is the Global attributes file.
- Stream properties object: This is the definition of a media stream and its properties.
- Content descriptions object: It contains all the information.
- Component download object: It provides broadcast component information
- Stream groups object: It logically organizes a number of multi-media together.
- Scalable object: It can define the scalable media relationship.
- Prioritization object: It can define the priority of the relevant flow.
- Mutual exclusion object: It can define the mutual exclusivity relationship.
- Inter-media dependency object: It can define the dependency relationship between the streaming media.
- Rating object: It can define w3c picks file ratings.
- Index parameters object: According to the necessary information, it can rebuild the index file ASF.

The header object can provide a well-known bit sequence at the beginning of the ASF file, it can conclude other header object information, and it provides the global information which is stored in the multimedia data.[14]

3.4.4 ASX file

ASX is a text file. Its main purpose is the reorientation of convection information. It is similar to RPM (RM's staging file).

The ASX file can perform four main functions:

1. It can control the media file from the web browser in order to deliver it directly to the Windows Media Player.
2. It can provide a file and can let the Windows Media Player visit Windows Media

Programs.

3. It can provide a flow reference description and the rules of the Windows Media Player to deal with the flow.
4. It can provide a playlist and can define Multiple Stream Players in the Windows. Media Player.ASX files are used to re-orient the stream information because at present, a common browser can not be directly used to play MMS protocol information, so we use ASX files. After the ASX files have been used once, when a browser finds a link with ASX format, it is aware of the need to use the Media Player to play the stream information, so it will start the Media Player. After that, the Media Player can use the MMS protocol to play the stream information. [15]

3.4.5 Windows Media Service

Microsoft's Windows Media Service is an optional component in the Windows server2003 Standard Edition, Enterprise Edition and Data Center versions. That is the server components in the Windows Media 9 series platform. In combination with the Windows Media Encoder and the Windows Media Player, it can browse through the Internet or intranet to provide users with audio and video content. The client can use the custom applications which the Windows Media Software Development Kit developed.

Windows Media Service features

Microsoft Windows Media Service is the ideal media server for delivering high-quality on-demand and live streaming experiences. The Windows Media Server Components are combined with the Windows Media Component Services and Windows Media Manager Component. The Windows Media Component Service is running on Microsoft Windows 2000 Server on a range of services. These services unicast and multicast broadcast video and audio content to the client. Component Services include the Windows Media Monitor, shows, radio stations and unicast services.

Windows Media Monitor Service provides services to monitor client and server connections with Windows Media Services.

Windows Media Program Service is used to stream Windows Media on Windows Media radio stations to provide them with a continuous program.

Windows Media Station Service offers Windows Media content for the multicast transmission and distribution services.

Windows Media Unicast Service offers Windows Media stream on-demand content to network customers, providing the service with point to point connections to the customers.[15]

3.4.6 Windows Media technologies

Windows Media is able to adapt to the conditions of a wide range of network bandwidths streaming multimedia information on a publishing platform. It provides a series of closely integrated services and tools for the creation, management, broadcasting and receiving through the Internet and enterprise intranet transmission of streaming rich multimedia content. It concludes streaming media production, publishing, broadcasting and management of a whole set of solutions. It also provides a development kit for secondary development.

Windows Media Video Service includes:

- Windows Media Service Component
- Windows Media Tools
- Windows Media Player

Windows Media has six parts:

- Windows Media Tools can create .asf files
- Windows Media Encoder creates .asf files
- Windows Media Encoder will be posted to the live stream Windows Media that is used for unicast or multicast content.
- Windows Media Services use .asf as a unicast or multicast content recourses.
- Windows Media Services go through the unicast that can play on the client.
- Windows Media Services go through the multicast that can play on the client.

Windows Media Services use ASF, that supports the network and the various types of data transfer under the agreement of open standards. ASF is used to order, organize,

and synchronize multimedia data transmitted over the network. ASF is a data format;but, it can also be used in the live demo format.

Windows Media Services protocol

In Windows Media Services, the MMs protocol, the MSBD protocol,and the HTTP protocol are the main protocols used.

MMS (Microsoft Media Server protocol)

MMS is a protocol used to access and accept the .asf files in the Windows Media streaming server. The MMS protocol is used to access Windows Media release point unicast content. If the content publishing point is published on-demand, the URL is combined in the name of the services and the .asf file name.

MSBD protocol

The MSBD protocol is a bypass in windows media encoder and windows media services component, and between the transmissions of streaming server. MSBD is a connection protocol, it is suitable for streaming media. Windows media encoder can support 15 MSBD clients, but in the Windows Media Services can support 5 MSBD clients.

HTTP protocol

It defines a Microsoft proprietary protocol referred to as the Windows Media HTTP Streaming Protocol. The Windows Media HTTP Streaming Protocol is a client/server-based protocol used to stream real-time data between the client (the receiver of streaming data) and server (the sender of streaming data).[9]

3.5 The main technical problem of streaming media

In order to transmit data packets through the streaming media, streaming media technology is employed to code / decode and store the data packets , on the network side of media services, and then steam them, to the client' side.

The original audio / video stream is encoded and compressed to the format of the media file storage The media server delivers media files on user requests to the client's

media player. The transmission in the media center may also need a proxy server for media content distribution or forwarding.

In order to achieve better quality of real-time playback of streaming media, we need to consider all aspects of streaming media. The three most critical factors affecting the transmission quality are: the performance and efficiency of encoding and compression, the performance of the media server, and the media streaming quality control.[14]

3.5.1 Encoding / Compression function

Many factors affect the performance of audio / video stream compression / encoding. The first one is compression efficiency. Compression efficiency requires a guarantee of audio / video quality under the premise that the media stream flow rate is as low as possible. The second factor is the coding redundancy and reliability. Common multimedia file compression / encoding is different from that of streaming media files that need to be transmitted on the network real-time because any data loss during the transmission will affect the decoding quality. To solve this problem, a number of advanced coding techniques, such as Error Resilient Encoding, have been developed in order to reduce the maximum effect on this quality. In the Internet environment, the most typical method is Multiple Descriptions Coding (MDC). MDC compresses the original video sequence into several streams, each streaming corresponding to a description, can provide an acceptable visual quality and better quality can be achieved by combining multiple descriptions.

Finally, it is also necessary to consider the ability to adjust the media stream compression / encoding rate because the network congestion situation is constantly changing and the streaming media encoding rate must be able to adapt to network changes. One approach is to use scalable hierarchical encoding, scalable compression / encoding generating multiple sub-bit streams (Sub-stream). A bit stream is a basic bit stream and can be independently decoded, but the output quality of the video sequences is not good: The other sub-bit stream is played the role of quality enhancement and all the sub-bit stream working together can restore the best quality of the video sequence.

Accordingly, the only part of the sub-bit stream is the output of the video image quality or image resolution, so the image of the playback frame rate is poor. When the network speed changes, it can adjust the output level to control the streaming speed and adapt it to network changes.[1]

3.5.2 Server function

The expansion of the scalable streaming media, creates some constraints in streaming media service functions. Streaming media server performance is a key indicator of current output capacity and can support a number of concurrent requests. Streaming media server function can be affected by many factors, including CPU capacity, I / O bus, memory bandwidth. Typically, a single media server can handle approximately a few hundred of concurrent streaming streams, therefore, in order to function better, the current high-performance streaming media server /utilises a large-scale parallel processing structure, such as the structure of the hypercube to connect the various streaming media service unit. Another method is a simple PC cluster, in this way, a streaming media server uses PCs with a LAN connection and front-end using content switching / load balancer, therefore, it will be streaming media distribution services to all PC media services in the cluster. This method is more functional, cost-effective and easier to implement than the scalable streaming media method.

3.5.3 Quality control of Streaming Media

Quality control is the most important constraint of a streaming media performance. During the streaming media transmission to the network, bandwidth, delay, loss rate have high requirements, but no connection is based on packet-switched IP network bandwidth resources and the ability to control the quality of service is less than, in the IP network streaming. Therefore, the Media Transfer application layer needs to adopt a quality control mechanism to solve the transmission problem. That quality control mechanism can be divided into several levels. The most common solution is to use a rate adaptation mechanism. The basic approach is to use the media stream encoding rate level at a certain rate through feedback mechanisms. The media server can then dynamically adjust the streaming media transfer rate, to ensure the client changes in the available bandwidth when on the network and can watch streaming media content properly. The rate adaptation mechanism attached to error control and redundancy control can effectively ensure the normal viewing streaming media. The main current

streaming media products are supplied with an application layer rate adaptation. Another method is to use the Content Distribution Network (CDN). There are three advantages of the streaming media CDN transmission: Firstly, the application layer content distribution, reduces the backbone network for streaming media traffic, and is implemented based on application layer Multicast simulation (using the system is independent of the logical network layer multicast tree, and the software on the host application layer multicast forwarding can be used). The second edge of CDN through the distribution of streaming media server is that it avoids the congested links and improves streaming performance and response time. Finally, the CDN can improve the streaming media system scalability, reducing the requirements of each streaming media server performance. At present, the use of CDN streaming media applications is a large-scale trend.

3.6 Streaming file format

Streaming file format is specially encoded to fit on top in the network to be downloaded rather than wait until the download complete files before it can be played. There are standard streaming media files available online to play, but they are inefficient. Compressed into a streaming media file encoded documents, must, if some additional information, such as timing, compression and copyright information. There are some streaming file formats presented in Table 3.6.

Table 3.6.Streaming file format

Video/Audio name	Media format type
asf	Advanced Streaming Format. (Microsoft).
rm	Real Video/Audio (Progressive Networks).
ra	Real Audio (Progressive Networks).
rp	Real Pix (Progressive Networks).
rt	Real Text (Progressive Networks).
swf	Shock Wave Flash (Macromedia).
viv	Vivo Movie (Vivo Software).

3.7 Media publish format

The media format is not a compressed format, nor a transport protocol, it does not describe the audio-visual and , does not provide coding. The media format is only a way to arrange audio-visual data, it is not concerned with the physical data, and we only need to know the data type and placement. Having data arranged in a specific way will help the development of streaming media, because we want to have an open media release format for commercial streaming products for all applications, the application of different compression standards and media file formats o release media to provide a standard method . We can also synchronize with the same format and different type of stream. A single of release media format should contain all different types of media information, such as time, multiple streams simultaneously, copyright and all information. The actual audio-visual data can be located in multiple documents, but the information contained from the media publish file will control the flow. There are some media publish file formats in Table 3.7.

Table 3.7.Media publish format

Media publish format	Media type and name
----------------------	---------------------

extension	
asf	Advanced Streaming Format.
smil	Synchronised Multimedia Integration Language.
ram	RAM File.
rpm	Embedded RAM File.
asx	
xml	

3.8 Media file compression format

Sometimes compression format is referred to as compressed media format: It includes a description of sound and images of the same information, and even it has become a small file size. Obviously, the compression process has changed the arrangement of data bits before the compressed media file format becomes the media, whose data need to become decompressed. As the compression occurs automatically, and is embedded in the media file format, the end user will not usually notice this kind of file. There are some audio and video types in Table 3.8.

Table 3.8.Video、 Audio expression types

File extension format (V/A)	Media type and name	Expression condition
mov	Quicktime Video V2.0	Possible
mpg	MPEG 1 Video	Yes
mp3	MPEG Layer 3 Audio	Yes
wav	Wave Audio	No

aif	Audio Interchange Format	No
snd	Sound Audio File Format	No
au	Audio File Format (Sun OS)	No
avi	Audio Video Interleaved V1.0 (Microsoft Win)	Possible

3.9 Creating and Producing

There are some steps to create material for streaming. The first step is to obtain the source material or media content. Source material can come from tapes, video tapes, digital audio, and even live sources. Quality source media is essential. If the original audio recordings are weak or have muddy sounding or plenty of background noise, they will sound even worse when streamed. Likewise, if the images and video material are fuzzy, unsteady or hard to see, they will probably look pretty bad when streamed. The problem is that if the user wants good quality audio or video streams, it is always necessary to have the highest quality source material from the beginning. Figure demonstrates that source material can be obtained with the types of equipment illustrated in Figure 3.9.

Quality Source Material

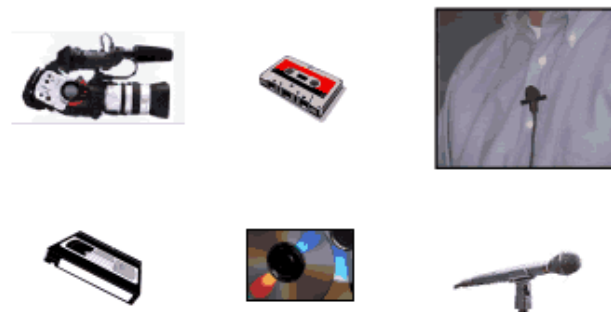


Figure 3.9. Types of equipment used to obtain source material [1]

The next step in the development process is to convert the source material into the correct digital format on the computer. The method of conversion and the digital material also greatly affected the quality of your streaming media.

3.9.1 Digitizing Audio

There are two main methods of digitizing audio files. First, the sound can be recorded by connecting the computer directly to the input microphone. Users can sit near the computer's recording device; background noise can be easily picked up by the microphone. In addition, finding a good quality microphone and sound system in a computer can often be difficult. Sound recording will depend largely on the type of microphone users, and how good the quality of background noise elimination is. A more professional audio recording method such as a very good record tape or a digital recorder is highly recommended as well as a high-quality microphone and a quiet room. After recording, the users then use the computer record digital cable on the audio output to line input the sound card. (See Figure 3.9.1.1) This method will usually produce the highest quality digital files, and provide a tape or CD backup of a user's original records. The original audio and video tape can also be connected to sound card line input from a VHS tape deck or digital audio output.[1]

Digitizing Audio

Record narration



Digitize it



Figure 3.9.1.1. Connecting the line output of the recorder to the line input. [1]

For digitizing audio, the user also needs audio editing software. (Figure 3.9.2) This software enables the user to set recording levels when digitizing and creating sound

files. The software can also be used to edit and enhance the quality of the sound files produced. The author highly recommends Cooledit for audio recording.

Digitizing Audio

Audio editing software



Figure 3.9.1.2. Audio editing software. [1]

3.9.2 Digitizing Video

Digitizing video usually begins with a video tape source that the user has either shot himself or obtained permission to use. There are two types of video source material: analog and digital. Analog video is produced by using a VHS, Hi-8 or beta cam format. Digital video is produced by using a digital video camera or recorder. The video material will need to be captured or transferred from the video tape to the hard drive of the computer.

When moving video material from tape to computer, the computer which the user uses must be equipped with special hardware and software (See Figure 3.9.2). Because most computers do not have video capturing and editing capabilities, the user may need to find another computer to use. When the user captures video for streaming, it is important that high quality video is maintained. The video files will likely be very large. Capturing, digitizing, and editing video files for streaming is a much more technical process than working with audio only. If the user has never done this before, it is strongly recommended to obtain some technical support.[1]

Digitizing Video

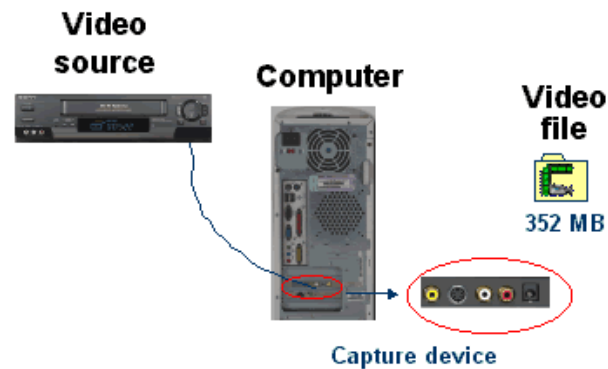


Figure 3.9.2. Digitizing video with special hardware and software.[1]

3.9.3 Slides with Narration

Creating media for streaming illustrated audio requires designing a presentation consisting of slides and an audio narration. PowerPoint or any graphics program can be used for creating the slides. A script is usually the first step in developing narration. The user records narration using one of the audio recording methods described earlier. Finally, special software is used to blend and synchronize slide files with audio files. Figure 3.9.3 illustrates slides with narration in the instance.[1]

Slides with Narration

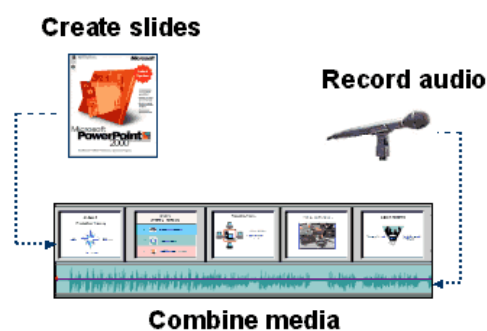


Figure 3.9.3. Slides with narration.[1]

3.9.4 Slides with Web-Cast

The streaming of network investment is a live event. Therefore, it involves using a microphone to capture the sound moderator, the one used to display slides, and in

some cases, the camera captures live images which are fed the computer. Special configuration of the computer location is needed to capture all of these media sources, and immediately convert them to a format that can be streamed. This computer is like the streaming media server itself and broadcasts materials online or material sent over the network, therefore it acts like a streaming media distribution server for the network. Acquisition and digital source streaming media is the first step. Finally the quality of streaming audio, video or graphics largely depends on how the user can capture material in the network.[1]

3.10 Bandwidth Basics

To succeed in transmitting online streaming media, it is necessary to understand the concept of bandwidth. All web page content, including text, graphics, animation, audio and video needs a certain amount of bandwidth to the network.

We can compare width or bandwidth to channel capacity. For example, a high-capacity pipe can allow a flow of 20 gallons of water per second flow. However, in the network, data packets are measured in thousands of bits and megabits per second. Technical staff use the term electronic data per second rate to describe how much data is transmitted through the network cable. On the Internet, most people measure 1000.data bits per second For example, a 28.8 modem has approximately 28,000 bits per second of bandwidth capacity.

To better understand the Internet data transfer rate, one needs to have already been familiar with the concept of bandwidth. In the computer's hard drive or media stream processor, a text file of about 48,000 bits per second, or about 6 megabits per second can take up all the space of the hard disk drive. This is a very large volume of data. Because of this bandwidth capacity, the user may have noticed that it is good practice to store audio and video files on the hard drive . The CD-ROM drive is another concept that is relevant to bandwidth capacity. Another concept related to the bandwidth capacity, is the CD - ROM drive. For example, a 12-speed CD drive, a computer's processor of the data stream, processes about 9000 kilo bits per second. Another example is a LAN connection through a school T-1 and T-3 lines to the Internet bandwidth and the ability. This can fluctuate according to network traffic, but most of the time, it can be expected to obtain about 5000 kilobits per second. Finally, we can compare a modem connection to the Internet as thin straw. A 56k modem has a

bandwidth of about 56 kilobits largest capacity per second. However, on a good day, lucky users will get 50 Kbit / sec. So, in other words, bandwidth on the Internet is extremely important for streaming audio and video files.

Sound and video files require high data rates and large amounts of bandwidth. For example, 1 second of full screen motion video, such as the TV screen a user can see, requires approximately 240,000 Kbit / s or 30 Mbit / s of bandwidth in order to play on the computer. Quality stereo CD-users like to hear require approximately 1200 Kbit / s of bandwidth to play on the computer at home. Inclusion-rich media like audio and video bandwidth requirements is the greatest challenge of streaming media on the network.

The best of the representative this challenge is analog streaming. Analog streaming combines four different media types with different bandwidth requirements which can be compared to four different liquid filling the same glass(See Figure 3.10). On the top, text is represented as t full-fat milk. Below that, the graphics are represented as the olive oil. The CD-quality music is represented as molasses. Film is represented as strawberry jam. Note that the straw (bandwidth in streaming media) has a limited bandwidth capacity. Our task is to absorb the four substances from the container, and record every second of each data type with the straw, as a result, only a few ounces (data packets) can pass through. If we use the same suction for the material, the following will happen. First, the less dense the material on the top of will easily flow through the straw's narrow bandwidth. However, as we go lower down, the material of CD quality music and motion video is not easy to pass through a narrow straw. In fact, the straw can very easily become stuck.

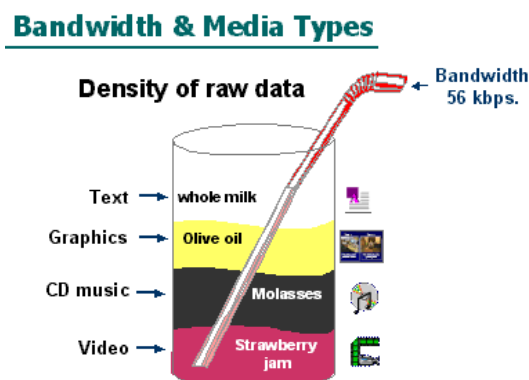


Figure 3.10. Graphic representation of bandwidth and media [11]

Audio, video-rich media is the current challenge. In fact, it is not exaggeration to say that streaming quality motion video through the modem bandwidth is compared to sucking strawberry jam with a straw. Only two kinds of methods can overcome this bandwidth bottleneck. First of all, we can increase the available bandwidth, but it is not always technically feasible for most people. Another option is to create smaller media files which are better able to go through the Internet pipeline. These compressed video and audio files can be obtained through the actual process of data flow on the Internet. Limited Internet bandwidth media files are a huge technical challenge. File size reduction and data compression is essential. But there are technical limitations because the compression can distort some files; on the other hand, some files can not be compressed because they will lose their quality.[1]

3.11 Using Streaming Servers

The previous section introduced creating, compressing and encoding media files for streaming. This section deals with how a user can deliver media files using a streaming server.

A streaming media server includes hardware and software. It includes a computer which contains the media files and connects to the network. This computer also has some very specialized management software, providing media files on the Internet process. The streaming media server provides the user with a level of control of the media, but the user can set up and manage servers more complex than the standard Web server. The user can place a standard simulation Web server streaming media file which is suitable for long clips media, a large number of users think that this is the most reliable approach. The streaming media server is also required if the composition of the contents is a synchronous multi-media slide show.

There are some important issues about streaming server users should consider:

First, the streaming media server can provide a limited amount of time to streaming at any given moment. In other words, tens of thousands of people can not access the server simultaneously. The capacity of a streaming media server is a measure of how many users can use its streaming media at the same time. This can range from anywhere from 20 to 5,000 or more media files depending on the type of server. If the user tries to play video clip, and the media server, has reached its maximum capacity, a

message appears and politely informs the user that the server is busy, and asks the user to try to play the media clip again after a minute or two.

If the user has appropriate hardware, network connections and technical expertise, then he can set up his own streaming server. However, in order to maintain a server, many users outsource this task to a host of technical and administrative responsibilities. The host can be a department that has the facilities and technical expertise for downloading/uploading the users' media content. Hosts generally charge for their services.

The user selects the host that can support his specific streaming media technology such as QuickTime, Real or Windows Media. Internet Service Providers or the campus departments check to see if they can hold a streaming media server.

The host will allow users to transfer files from a local computer to the streaming media server. This usually requires the FTP client to use special software to complete the transfer. The software allows the user to select from the local hard drive and copy the media files on the Internet to another computer. The host will set up user accounts and password-protected server spaces and specify the media file size. The host can allow users to copy the media files directly from their computer to a folder on the streaming media server. Users should be able to delete and update files on the server. Since most of the streaming media files are highly compressed, and take up a small volume, sufficient server space is not a problem.

It is worth noting that text and graphics on Web pages reside on the Web server. Streaming media files, however, are placed in a streaming media server. Through the use of HTML tag on the page, the user can trigger and control the streaming media server to playback the media files. This involves a specified target path of the media files in the streaming media server (See Figure 3.11). Each of the three streaming technologies has its own unique HTML server control in their respective media clips embedded tags. Several coding software and applications can develop these HTML tags for users.

Paths to Streaming Servers

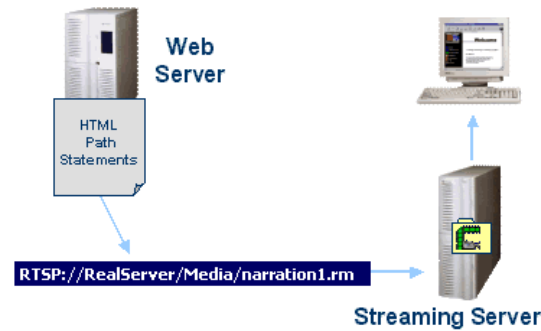


Figure 3.11. Specified targets path of media files on the streaming media server.[1]

Streaming media clips can be integrated into a Web page in one of two ways - as a floating pop-up window or embedded into the page. This is performed through the HTML tags. A floating pop-up window can be very easily created and provide the user with access to all the player controls and menus. The embedded media clip is fixed on a Web page as an image. The play, pause and forward buttons are embedded into the page through the control panel. Users can also play a media clip on a web page.

4. Streaming Applications

Streaming media in computer applications is a form of on-demand software distribution. The streaming application uses modern computer programming languages and operating systems running on the production and application code source. Computer programs need only a specific part of the instance of any end user and can be used to perform specific functions.

This means that the client computer does not need to completely to install streaming applications, but if the network has a low bandwidth and the transmission is slow, then the user needs to install streaming applications. Streaming applications are usually installed with a virtual application so that the application is not installed in the traditional sense.[15]

The most popular applications for streaming media include:

- Sales & Marketing Meetings
- Product Launches
- Annual Meetings
- Employee Development Workshops
- Seminars
- Online Workshops
- Prospect Demonstrations
- Security Briefs
- Advertising

In practice, streaming applications can greatly help enterprises, for example to cut costs, communicate clearly, broaden their target markets, and strengthen their brand. The following list demonstrates some benefits of streaming:

saving money through reduced travel

more effectively communicating using messaging that entertains while informing and motivating

showing an animated version of products and services

leveraging the power of the web by making information available anytime and anywhere

improving branding by using images and arrangements

appealing to experienced Internet users who lead the bulk of online commerce

4.1 Streaming media applications

The streaming applications can be divided in four categories: .

4.1.1 Distance Education

In the distance learning process, the basic requirement is to pass information from the teacher to the remote students. This information may be diversified, which includes all types of data: such as video, audio, text, picture and so on. Streaming applications are used to transmit such information, to achieve better teaching results. With the current network bandwidth limitations, streaming media is undoubtedly the best choice as students at home through a computer, a telephone line; a Modem can participate in distance learning. As far as the teachers are concerned, there is no need to do too much preparation, the teaching method is similar to the traditional teaching methods but assisted with a web camera and a computer only.

With the exception of real-time teaching, no other streaming media application than VoD (Video on Demand) can provide more individualized, interactive teaching. Students can also network to share their learning experiences and achievements. Large enterprises can take advantage of the current technology-based distance education system as a means of training staff not only transmitting video and audio, but also computer graphics screen capture to the students. Now Microsoft has a large number of distance education programs for its own worldwide staff training and communication between branches.[11]

4.1.2 Broadband Video on Demand

The previous section mentioned VoD (Video on Demand) – which is not a new concept, the first VoD application was Karaoke, then VoD tried to satisfy the need for semi-automatic participation. With the development of the computer, VoD technology is increasingly used in Local Area Networks and cable television networks. VoD technology is continuously improving, but there are difficulties that hinder its development, that is, large media files.

In the Video-on-Demand context, we can abandon the LAN and the Internet, as streaming media as special coding makes it very suitable for Internet transmission. The client can use the browser to demand, and does not need to maintain the browser. Thanks to the advanced cluster technology, concurrent large-scale distributions process requests on demand, so that they can adapt to a large-scale on-demand environment.

With the broadband network and the development of information appliances, streaming media technology will be more widely used in Video-on-Demand maybe one day users can enjoy in their own home streamed video programs equivalent to television programs. At the moment, many large news entertainment media, such as foreign CNN, CBS, and China Central Television, and Shanghai Television, broadcast Internet-based streamed audio and video programs, called webcasts.[11]

4.1.3 Internet Broadcast

With the increasing popularity of the Internet users, to watch sporting events, major festivals, trade fairs directly from the Internet. First of all, many companies are hoping to webcast their products and activities all over the world. All this has led to the formation of the Internet broadcast. Live streaming media technology on the Internet plays an important role as streaming media can use a low bandwidth environment to provide high-quality audio and video. Secondly, intelligent streaming technology, such as Real's Sure Stream, ensures that users with different connection speeds can have different quality audio and video. In addition, streaming media multicast technology can significantly reduce the load on the server side, while maximizing the savings in bandwidth. Technically, live Internet streaming of many applications is the most mature technology.[11]

4.1.4 Video Conference

There are many video conferencing systems on the market which support the basic TCP / IP network protocol, but the use of streaming media technology as a core technology system is not in the majority. Video conferencing technology is related to data acquisition, data compression, network transmission and many other technologies. Streaming media has a commercial use in video conferencing. Through the streaming media we can have point to point communications, and the most common example is the video phone. If we have a computer that has access to the Internet and a camera, we can communicate anywhere in the world with people with audio and video communications. In addition, large companies can reduce costs by using workflow technology-based video conferencing systems to organize trans-regional meetings and discussions. A practical example is the second largest U.S. Securities dealers since 1998, provided by Starlight Network streaming technology solutions for distribution in more than 500 cities and regions in the global division of

brokers and investment advisers to provide real-time to desktop financial news, so that their customers get more returns on investment.[11]

4.2 Streaming Media in P2P

Streaming technology is very promising for P2P applications, for two reasons. First, as streaming media, a P2P-based distribution network does not need to have specific routers and network infrastructure to support multimedia data and it is cost-effective and easy to deploy. Second, users can download streaming media which are also available to other users. Therefore, if users want to expand the scale, they need more available resources. As the P2P-based streaming media network of peers is unstable, the P2P streaming system needs to improve in the areas of technology, peer selection techniques, fault tolerance and security mechanisms. In addition, there are challenges such as the managing the node, constructing the distribution tree, node failures and adapting to unpredictable changes in the network.

Recently, P2P streaming media attracted attention in academic and industrial circles. All kinds of P2P streaming algorithms are studied, and systems have been developed. About more than a dozen of P2P streaming media systems are now deployed in China. In particular, P2P network television is very popular. After buffering, a segment shows its Media Player, and at the same time, it starts the Media Player's buffer in the next segment. Ideally, there should not be any sound or video frame freeze.

Unfortunately, in reality, the Internet server and network channels and the user are often overcome by a sound and / or video frame freeze. This is a problem that P2P technology can help resolve. Software like PPLive, PPStream, Coolstreaming, QQLive, SopCast, Feidian, TV Ants allows users to watch streaming media and it includes some TV channels based on [BitTorrent \(BT\)](#) P2P technology.

P2P Streaming Internet TV software in the local host to create a stream, and then play in the Windows Media Player, Real Player or other media player.

As the P2P technology depends on sharing more segments of media data upload with other users, who in turn shall allow other users to download. This is why it may take a few minutes before the flow runs continuously. One user is uploading to other users at a rate high enough to download a segment. It is, therefore, recommended to establish a necessary event before the start time. The more users share, the better part of the flow of each of them will become.

In China, streaming Internet TV is very useful in daily life. Basically, all computer users use this software.

4.2.1 P2P Streaming Media technology

Because the P2P Streaming Media system has unstable nodes, it needs to employ file location, node selection, fault tolerance and security mechanisms.

File location

Real-time streaming media services have a very strong, fast and accurate positioning of the streaming media file system to solve the basic problems. In the P2P streaming media system, the new customers are added in the overlay network in P2P file and search to find a method to provide media content and connect the nodes to receive media content from these nodes.

Node selection

In a typical P2P overlay network, the network nodes form various autonomous domains, so the node can be at any one time free to join or leave the overlay network, resulting in a very dynamic but uncontrollable overlay network. Therefore, the P2P streaming system urgently needs a service session initially to identify a relatively stable node that can provide a certain Quality of Service (QoS).

Fault tolerance

As the P2P streaming systems are dynamic, the transmission link may also be interrupted due to congestion and failure. In order to guarantee continuity of service,

fault-tolerant mechanisms must be implemented so that the service capacity of the system will not be affected or will be automatically restored.

Data coding techniques can also provide system fault tolerance, such as Forward Error Coding (FEC) and Multiple Descriptions coding (MDC). FEC through a compressed media stream with a certain degree of redundant information effectively improves the system's fault tolerance. But the basic idea of MDC is the same as described in the media content stream using a variety of ways, each of which can be provide acceptable quality of separate decoding. A number of descriptive methods can be combined to enhance the quality of decoding. Both codes can adapt to the characteristics of heterogeneous clients, and customers can be charged according to their ability to choose how much data is decoded. In addition, the combination of FEC and MDC can achieve better fault tolerance effect.

Security mechanisms

Network security is a basic requirement in the P2P streaming system; which must have security identity authentication, authorization, data integrity, and confidentiality and non-repudiation techniques, as well as information security control. At this stage we can use DRM technology control for property control; for P2P-based enterprise-class streaming media broadcast system, we can install a firewall to prevent unauthorized access; Internet P2P streaming media system can also be encrypted to ensure security of data packets. In the P2P streaming system, the user level authorization methods can be used to prevent unauthorized access.[8]

5. Streaming media application prospects

The rapid development and popularization of Internet for streaming media business provide a strong market momentum as streaming media business is becoming more and more popular. Streaming media technology is widely used in Internet multimedia news releases, online broadcasting, online advertising, e-commerce, video on demand, remote education, telemedicine, Internet radio stations, real-time video conferencing and other aspects of the Internet information services. The application of streaming media technology for network information exchange has brought about a revolutionary change; it will have far-reaching impact on people's work and life. The following are

examples of a few typical applications of streaming media technology in China: streaming media technology is used in the live on-line applications, such as CCTV's streaming media use RealNetworks technology to achieve an audio-visual online and Tsinghua University campus has news broadcast systems. Streaming media technology is used on the Video-on-Demand applications, such as Hunan TV, China World Hotel, Wangjing Residential and other uses of Oracle's OVS system (which supports a set-top box) to achieve Video-on-Demand. Streaming media technology education applications are used in distance education, such as Beijing University Posts using Cisco's IP / TV system to achieve distance education. For example, streaming media technology is used in e-commerce, telemedicine, etc. There are many successful examples of this application. Because of this, many well-known companies adjust their strategic direction in the streaming media market to catch an advantageous segment of the market.

Bill Gates: the future belongs to Streaming Media

The 99 West Streaming Media Conference was held in San Jose, California. Microsoft Chairman Bill Gates delivered a keynote speech at the conference announcing the successful adoption of Microsoft Windows Operating System in personal computers of every family, the current software development is at an important juncture; the software will make multimedia content on the Internet to become a part of in everyone's daily life. Gates said that Microsoft's streaming media is really at a promising direction of development. It will become a mainstream in personal computer and networking equipment applications. In his speech, Gates demonstrated the new application software - Windows Movie Maker. This will be the component from the Golden Age, the Millennium Windows Operating System. Through the software, users can shoot with a hand-held camera and transfer the images to their personal computer for editing and release. Gates also showed the streaming video content of TV set-top box can be downloaded from the Internet. He said that with the use of set-top box software, users can watch TV on the Internet on any video content. Gates also predicted that the future workplace will undergo tremendous changes. The wide use of Streaming media and application will help companies reduce costs, as video conferencing and the staff of vocational training are available through online video. Gates said: "streaming media and the Microsoft Office software combined together will work for people to bring about a revolution." Compaq, Intel, Business Digital Island and Compaq Computer, Intel, and Microsoft, three companies in the next two years, will use the streaming media for the

construction of 8000 units within the streaming server. The scheme is expected to be deployed in 350 major cities around the world to establish a foothold, in which more than 250 cities are located outside the United States, and can handle 7.5 million simultaneous voice or video data stream. Digital Island's President and Chief Executive Officer, Ruann F. Ernst, said: "This is the first time in the history of the Internet that the television networks are comparable to handwriting."

A broad development prospect of the streaming media market

The survey ratings authority Nelson of Nielsen / Net Ratings [15] released an exciting figure - alone last year: the number of online access to a full streaming media content increased by 65%, indicating that the demand for rich media certainly will contribute to the overall framework for innovation. The report noted that in November 2008 the number of visits to visitors streaming content was as high as 35 million passengers, which means that over one-third of the Internet users have read streaming content. Nelson said that this amazing growth can be attributed to several international events, such as the Olympics, the United States presidential election, and so on, tens of thousands of readers during the event to accessed online audio or video updates.

Streaming media trends

As the streaming media market matures, it is time to look at the trends and examine how this market is segmented. The largest segment of streamed media users are women. Nelson found that the number of female visitors who read online streaming content has gradually increased and is expected by the end of 2010 to reach 16 million passengers, a level higher than in 1999. Male visitors are approximately 19 million, representing 56% of growth in 2009. It also is unexpectedly amazing that the number of elderly visitors is growing. In 2010 there will be 14 million visitors over the age of 65 accessing streaming content, and this a 95% increase compared to the number of elderly users in 2009. .

Nelson pointed out that the growth of streaming media is inevitable. It is expected in the near future that content providers will use a variety of high technologies to meet the increasingly demanding requirements of network users. The convergence of different media helps the target audiences to achieve their communication objectives. The

report also pointed out that 50% of the Internet users have high-speed links to receive streaming media information. Nelson also cited a report by U.S.Bancorp Piper Jaffray released in October, pointing out that once the contents reach a certain level of refinement, streaming media will drive the next wave of Internet growth.

Nelson further estimated that the network streaming media in 2011 in the United States will reach 21 billion dollars in market size, which is more than double the growth in 2009. The survey sample was 70,000 Internet users, of which 62,000 accessed the Internet from home, another 8,000 from the place of work online.

Streaming media market competition

Streaming media companies fiercely compete with each other for a share in the market. Now 45% of the companies choose the Windows Media Player as their streaming media software. This shows that a growing number of Internet media content providers are choosing Microsoft technologies to replace Real Networks which is for the time being the leading streaming media technology. HP also said it would use Microsoft's Windows Media Player for its own employees and partners to conduct business and business marketing communications, such as product launches and sales staff training. TI said its next-generation programmable Digital Signal Processor (DSP) will support the Windows Media Player. Windows Media Player has another new supporter - General Instrument said it would put Windows Media Player into its DCT 5000 set-top box terminals used to transmit through the Internet on the cable network A / V streaming media content.

It can be predicted that as streaming media technology continues to evolve and improve, the users' demand for streaming media will increase, streaming media technology will soar to new heights. The Streaming media services market will grow larger and larger.

6. Summary

Recently, streaming media have become more and more popular. Not only do companies use this technology, but it has also come into people's daily life. Individuals use streaming media for entertainment. Companies use streaming media to make their products better than before. The use of streaming media can be used very effectively in online learning. Streaming media has two main ways that users can access and experience media: first, they can access media on-demand, and save them to a file so that it can be played later any time the user chooses; second, live-broadcast is broadcast at the same time as the speaker is lecturing.

However, streaming media has some limitations which can make the experience frustrating. But, the streaming media delivery can be a stimulating means of receiving course content and it is the extra effort required. Streaming audio and video is affected by three important factors: the internet connection bandwidth, the computer's processor speed, and the amount of memory. The main streaming media are: Application users view streaming media, like: QuickTime, Real Player, Windows Media Player, and RMF .

Streaming media are steadily emerging as a cornerstone of effective enterprise-wide communication and knowledge-sharing programs. It is a widely held maxim that visual communication tools greatly enhance the power of the message and participant retention. Streaming media capitalize on the opportunity to inform and entertain simultaneously. Like many online technologies, streaming technology also reduces the cost of communications, and can have a dramatic impact on organizational performance through applications in the marketing, sales, internal communications, and training departments.

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