Application of College English Listening Online Examination Platform Based on Streaming Media Technology

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***Abstract*—As one of the key contents of the college English test, listening online examination has become one of the required questions on the online examination platform. Due to the large size of the listening file, how to ensure the smooth playback of the listening file has become a problem that must be solved in the online examination. This paper focuses on solving college English listening online examination by using streaming media technology. It gives an overview of streaming media technology, and proposes the use of streaming media technology to build the college English listening online examination platform. It can ensure the smooth reception and playback display of the terminal data stream of the listening online examination.**

Keywords — English listening; Streaming media; Online examination

I. INTRODUCTION

In recent years, along with the development and popularization of information technology and 5G, reform of teaching methods and teaching management in colleges has had a profound effect, and college English online examination are also on the rise. College English, as a public course with high requirements on reading, speaking and writing, requires that English teaching be changed from reading to listening and speaking, and listening ability directly restricts speaking ability. Therefore, listening is the key to English learning. Listening exam is an essential part of the online examination of this course. On the basis of limited equipment, it has great significance to study how to carry out thousands of students to take the online listening examination concurrently. This paper chooses streaming media technology to provide a technical solution for the online college English listening examination platform [1].

II. INTRODUCTION OF STREAMING MEDIA TECHNOLOGY

A. Streaming Media

Streaming media is multimedia that is constantly received by and presented to an end-user while being delivered by a provider [2]. The verb "to stream" refers to the process of delivering or obtaining media in this manner; the term refers to the delivery method of the medium, rather than the medium itself, and is an alternative to file downloading, a process in which the end-user obtains the entire file for the content before watching or listening to it. With the development of network technology, streaming media technology broke through the limitation of the network bandwidth of multimedia information transmission, to a certain extent. For this advantage, it is widely used in the live webcast, remote education, online advertising, video on demand, video conference and other fields.

Traditional network transmission of multimedia information such as audio and video are fully downloaded before playing. It often takes several minutes or even hours to finish it. Obviously, this is not feasible on the real-time requirements of the very high listening online examination system. By using streaming media technology, it can achieve streaming transmission. The continuous, uninterrupted transmission of sound, video, or animation from the server to the user's computer. So, users do not have to wait until the entire file is downloaded completely. It only takes a few seconds or more than ten seconds of startup delay and it is available for viewing. The rest of the file continues to be downloaded from the server while audio and video are playing on the user's machine.

Streaming technology is divided into two, one is sequential streaming, and the other is real-time streaming. The following is a comparison of the two transmission modes:

TABLE I. TREAMING MEDIA PROTOCOL

Difference	**Real-time streaming**	**Progressive streaming**
Audio video data source	Collected in real time from the recording device, or a file (transferred using a proprietary protocol)	Audio and video files available
Server type	Dedicated streaming media server, such as: QuickTime Streaming Server Real Server Windows Media Server	Ordinary HTTP server or FTP server
Transport protocol	specialized protocol RTSP, HLS or RTMP etc.	The general HTTP protocol is the same as that used to transport web pages.
Jump	Arbitrary fragments can	At any given moment,

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	be accessed at random	users can only view the part that has been downloaded and cannot jump to the part that has not been downloaded.

Progressive streaming transport is sequential downloading, in which the user can watch the file while it is downloaded. However, the user's viewing is not synchronized with the transmission on the server. Users only see the information uploaded by the server after a delay, or they always see the information sent by the server some time ago. During this process, the user can only view the part that has been downloaded, and cannot ask to jump to the part that has not been downloaded. Progressive streaming is suitable for short segments of high quality because it can guarantee the final quality of the program. It is suitable for the audio and video programs posted on the website for users to play.

In real-time streaming, audio and video information can be viewed in real time. In the process of watching, users can fast forward or backward to see the contents in front or behind, but in this transmission mode, the received signal effect is poor, if the network transmission condition is not ideal.

B. Streaming media protocol

At present, the mainstream streaming media protocols mainly include RTMP [3], HLS [3], RTSP [4], etc.The main functional differences are shown in Table II:

TABLE II. STREAMING MEDIA PROTOCOL

DIFFERENCE	RTMP	HLS	RTSP
Full title	Real Time Message Protocol	Http Live Stream	Real Time Streaming Protocol
Upper-layer protocol	TCP or HTTP	HTTP	RTP，RTCP
Software model	C\S	B\S	C\S
Major source of Research and development	Adobe	Apple	Microsoft
For clients	Browser supporting flash products; Browser supporting HTML5	Browser supporting Safari of Apple; Browser supporting HTML5	Player
Video format requirements	FLV， F4V	MP4	/
Sever requirements	Dedicated Flash server; Flash Media Server Red5	Ordinary HTTP browser	Dedicated RTSP streaming server
Live broadcast requirements	Dedicated encoder upload; Flash Media Encoder	Dedicated encoder upload; Apple development tool	Server related, Custom upload
File playback requirements	FLV, F4V file, the server will decompose automatically into F4f data file and f4x index file	TS data files, M3u8 indexed file	Server related, Player related

C. Streaming Media Transmission Format

In the use of streaming media technology, it should adopt the corresponding format of the audio and video files. Files in different formats need to be played with different player software. Several popular streaming media transmission formats are shown in the following Table III:

TABLE III. STREAMING MEDIA TRANSMISSION FORMAT

Manufacturer	Format
Microsoft	File suffixes: .asf and.wmv
RealNetworks	File suffixes: .rm and .ra
Apple QuickTime	File suffix: .mov

In addition, there are MPEG, AVI, DVI, SWF, FLV and other file formats suitable for streaming media technology.

III. THE ARCHITECTURE DESIGN OF STREAMING MEDIA LISTENING EXAMINATION PLATFORM

From the top to the bottom, the listening platform framework is divided into application layer, business layer, network layer, data layer and system layer, as shown in Figure 1.

System layer. It provides the most basic operating environment, including the most core operating system support, Java environment support, FFMpeg codec and Mp4Box support [5].

The data layer [6]. It provides the system platform to save all the data, and generates video shard file and the corresponding MPD index file according to the mpeg-dash standard following the coding configuration rules. It can quick positioning the location of each video shard or index, timely respond to the service request of the upper layer.

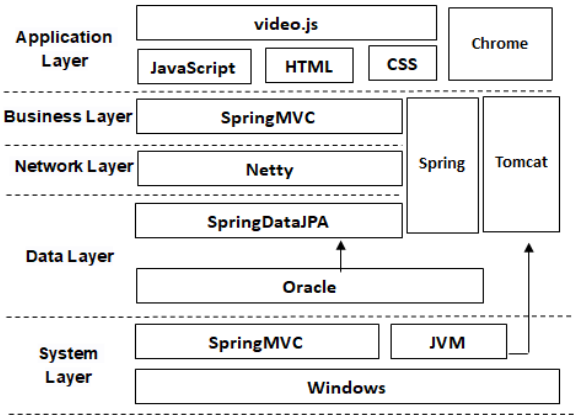

Figure 1. Architecture of Streaming Media Listening Examination Platform.

The network layer. It provides HTTP2.0 web services. The prepared fragments of the data layer are encapsulated as HTTP2.0 packets and published over the network.

The business layer. It is responsible for handling the routing request from the client side and performing authentication and verification. It also can ensure the security of the link, managing the relevant information of the video material, and providing the service of audience comment interaction and so on.

The application layer. Pages written with JavaScript, CSS, and HTML are rendered to users at different terminals, and it is responsible for receiving and parsing streaming media information in the meantime.

IV. Function Realization of Streaming Media Listening Exam System

A. Data Table Design of Listening Examination Platform

According to the types of English listening examination questions, the storage concept structure is designed as "listening questions" and "listening options" to store the information of an exam question and single choice questions. Therefore, there is a one-to-many relationship between "listening questions" and "listening options". One "listening questions" includes several "listening options", and one "listening options" can only belong to one "listening questions". The logical structure is the actual structure of DBMS data storage. The transformation of conceptual structure into the logical ones supported by Oracle is shown in table IV and Table V.

TABLE IV. Question Info

No	Column Name	Data Type	Length	Remarks
1	ID	int	4	
2	SubjectID	int	4	Subject ID
3	QuestionType	char	3	Question Type
4	QuestionTitle	text	16	Question Title
5	Epid	int	4	Set of questions
6	KnowledgeID	varc har	100	Knowledge points
7	Difficulty	char	1	Difficulty
8	OptionAnswer	text	16	The answers are divided by #
9	OKAnswer	text	16	The answers are divided by #
10	OKMemo	varc har	5000	Answer description
11	IsShare	char	1	Public or not
12	IsCheck	varc har	3	Checked or not
14	MediaFile	varc har	100	
15	MediaFileName	varc har	50	Name of listening file
16	IsUse	char	1	Available or not
17	CreatTime	datet ime	8	Creation Time
18	CreatUser	varc har	50	Creation User

TABLE V. Option Info

No	Column Name	Data Type	Length	Remarks
1	ID	int	4	
2	QuestionID	int	4	Question No.
3	OptionAnswer	text	16	The answers are divided by #
4	OKAnswer	text	16	The answers are divided by #
5	MediaFile	varchar	100	
6	MediaFileName	varchar	50	Name of listening file
7	CreatTime	datetime	8	Creation Time
8	CreatUser	varchar	50	Creation User

B. Server Design of Streaming Media

1) Processing Flow of Streaming Media Server

It mainly deals with the media resources that need to be transmitted and played, including coding module, video segment segmentation module and video segment resource management module, as shown in Figure 2. The coding module is specifically responsible for encoding the given video resources that need to be transmitted and played. The segmentation module is mainly responsible for dividing the encoded video into video segments with different bit rates and generating corresponding media description files. The video resource management module is responsible for the management of a large number of video segments and media description files generated after processing by the segmentation module, including the quick location of the appropriate resources and the cache of hot resources.

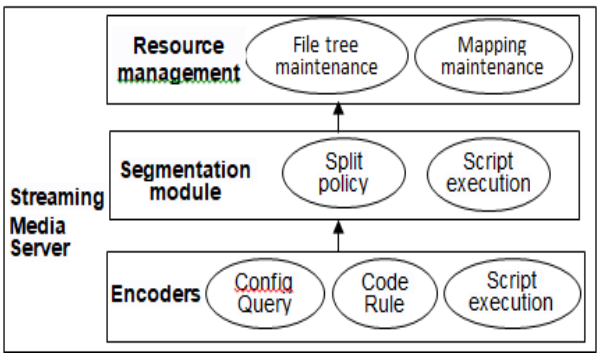

Figure 2. Processing Flow of Streaming Media Server.

2) Deployment of Streaming Media Server

Step 1: download and install the static version of Ffmpeg on Windows.

Step 2: create a new ffmpeg folder in any disk, copy the extracted contents to the ffmpeg folder, and configure the corresponding environment variables (add the path of the bin folder in the path of the system environment variables).

Step 3: open the Windows terminal and enter the command "ffmpeg – version". If the command prompt window returns the version of ffmpeg, the ffmpeg installation is successful.

Step 4: the following two lines of command in a terminal execution can separate streaming video and audio streams:

ffmpeg -i input_file -vcodec copy -an output_file // separation of video streaming

ffmpeg -i input_file -acodec copy -vn output_file // separation of audio stream

3) Deployment of Orcal Database Server

Database independent deployment can carry large scale data operation, realize centralized control of data, and ensure data consistency and maintainability.

4) Deployment of WEB Server

The Web server provides the operation interface. The interaction between the client Web browser and the Web server is realized through HTTP/TCP. The Web server finds the streaming media resource address and encoding type in the streaming media server through the positioning function. The client Web browser starts the streaming media player and USES the RTSP/TCP protocol to request the streaming media server to play a first-class media resource. The streaming media server uses the RTP/UDP protocol to deliver the streaming media to the client for playback after responding to the request of the client player.

C. Terminal Design of Streaming Media for Listening Exam

Listening Examination terminal is developed by using Video.js open source player framework. Video.js is a general JS library embedded in the web Video player. Video.js automatically detects the browser support for HTML5. If HTML5 is not supported, Flash player will be used automatically. The framework supports for the standard RTMP protocol specification.

The video.js plug-in is referenced in the html code, and the code is as follows:

```
<video id="vlc" class="video-js vjs-default-skin" controls preload="none" data-setup='{}'></video>
```

Use js to play the adaptation of RTMP and HLS, the critical code is as follows:

```
player.ready(function() {
    var myPlayer = this;
        myPlayer.reset();
    if (scope.type == 'hls') {
        console.log('hls');
        myPlayer.src({ type: "application/x-mpegURL", src: scope.url });
    } else {
        myPlayer.src({ type: "rtmp/flv", src: scope.url });
        console.log('rtmp');
    }
    myPlayer.load(scope.url);
    myPlayer.play();
})
```

The final effect of listening test web page is shown in Figure 3.

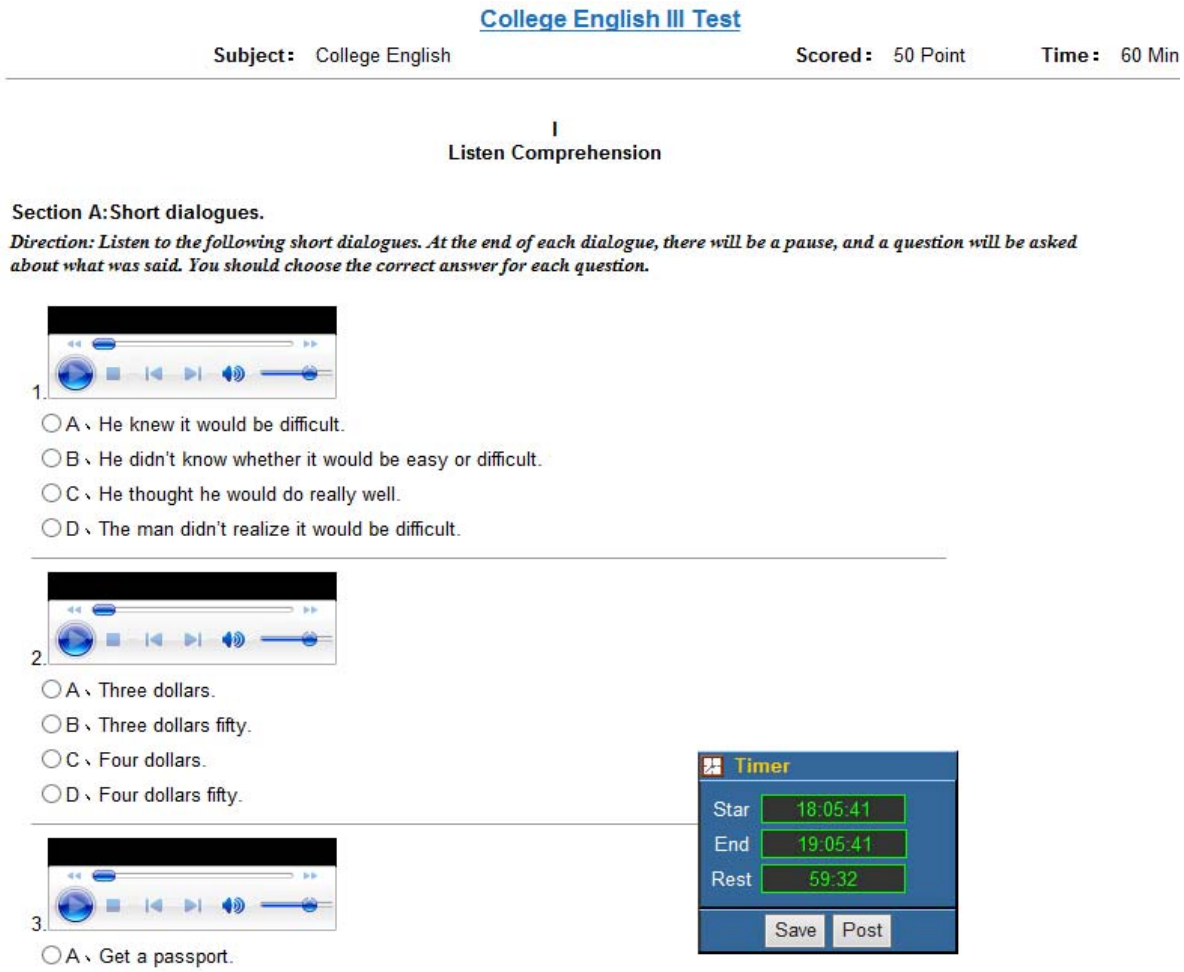

Figure 3. Listening test web page effect.

V. CONCLUSION

This paper designs a college English listening examination platform based on streaming media technology. In order to solve the problem of how to ensure the smooth playback of listening files in the current college English listening test, this paper proposes the construction of an English listening test platform based on streaming media technology, and completes the design of an English listening test system based on streaming media. Through practice, the streaming media English listening examination platform can ensure the effective transmission of audio and video resources in English listening examination. It can improve the transmission speed and quality for guaranteeing the successful operation of English listening examination.

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