

Development of Web Based P2P system and its Application for Chinese Language Learning

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Abstract—We developed a prototype web based Community to support telecommunications that uses P2P technology with real time video and audio, we called Web-based Peer-to-Peer Education Community Coordinated Multimedia (WP2PECCM). It is a novel concept of multimedia applications as Web services. The product of P2P is most based on the additional program need the user to download and install. A generic WPPECM scenario is created and examined first. The WPPECM model is designed with respect to service architecture, a tunneled hierarchical P2P model and metamodel framework.

Keywords — Web-based, Peer-to-Peer, Education Community, Multimedia

I. INTRODUCTION

With the development of globalization, Chinese as an international language is becoming more and more important in the international communication. Speaking fluent Chinese becomes essential for whoever wants to play a role in the global economic environment. Besides the Chinese native speaking countries, most people in the world must learn Chinese as a Second Language (ESL).

Currently, the successful Chinese training is face-face training model that has been proved to be effective to the improvement of learners' Chinese listening and speaking ability. Since the limited resources for experience teachers and physical training centers and the inconvenience of home-to-school or work-to-school traveling and fixing schedule, a lot of people miss the chance learning Chinese effectively.

The severe on-demand of Chinese training, for example in the USA, people are so passionate to learning Chinese speaking and listening, leads to the rising price for Chinese training. While the Chinese training quality has greatly developed in coastal area, the remote provinces are still lack of the high quality Chinese training.

Another hand, user experiences emerge from the active participation in events or activities and lead to the accumulation of knowledge, skill and enjoyment. This is made possible by ever-growing amount of networked multimedia content (e.g., video, audio) and multimedia-intensive services

(e.g., multimedia searching, annotation) together with growing number of mobile users and deep penetration of broadband Internet connections. Collaborative use of multimedia content and multimedia-intensive services empowers users to experience the real world and share it with other users. The above emerging technical phenomena is generalized with a term 'Community Coordinated

Multimedia' (briefly, CCM) and is characterized with Web accessibility, Web service-driven, mobility, equal participativity, etc. [1]. And this technology made the online education [2] [3] [4] [5] possible.

P2P ("peer to peer"), a trend of decentralization, is generally characterized by the direct sharing of computer resources (CPU cycles, storage, bandwidth, and content) rather than requiring the intermediation of a centralized server. P2P reduced the load of server much. After its appearance, P2P network has changed the visage of the Internet, and has attracted a great deal of attention from computer science research. Today, P2P networks are mainly used for file sharing and content distribution (audio, video, data or anything in digital format). However, little research and practice work of P2P has been made on Language Education Community, where we believe P2P can help promote the current level of online education.

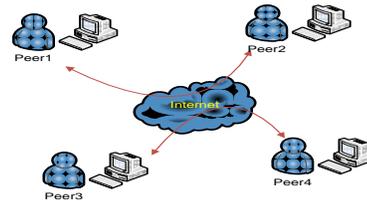


Fig.1 P2P applications

However, most existing P2P systems [6] [7] [8] are heavy weighted, integrated multimedia application systems. Meanwhile they are not Web -based and accessible via current mobile devices. Need user to download and install much software.

We have developed the web-based P2P Education Community based on flash. User cannot only sharing their experience with others also can have the live class have a live

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video audio class with teacher face to face. WP2PECCM Live classes are not just another language exchange program with a Chinese Friend over the Internet. It is similar to a 1 on 1 private lesson. The teacher will talk to the student live using our voice and video utilities so the student will see and talk to his private instructor who is giving his undivided attention to the student during the whole session. In the lessons the student will also be using a whiteboard application to practice reading and writing, and also point and highlight text etc. Self-study demands a big portion of self-motivation. The student has no means to verify if the skills he learns are correct. With WP2PECCM Live class a trained Mandarin Tutor will be helping the student to improve all 4-communication skills (reading, writing, listening, speaking) and make learning much more effective.

This paper presents the concept of Web-based Peer-to-Peer Education Community Coordinated Multimedia (WP2PECCM) in terms of Multimedia Application as a Web Service. The paper focuses on presenting the implement of WP2PECCM. The remainder of the paper is organized as follows. Section 2 gives basic definitions relevant to WP2PECCM concepts. Section 3 presents the design of the system. Section 4 presents the key technologies of the system. Section 5 draws a conclusion.

II. THE ELEMENTS AND MODEL OF A WP2PECCM

We hold that a WP2PECCM should basically have the following elements: theme, user, played role, activity, supporting services and relationships between members. Considering these factors, we modify the model in [9]; propose our WP2PECCM model (see Figure.1).

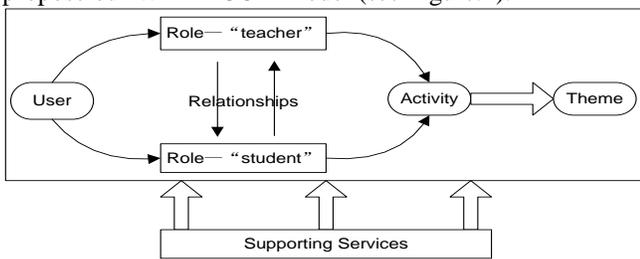


Fig. 2 WP2PECCM model

- (1) Theme: the common studying purpose of participants in WP2PECCM. It can strongly hold together the members of the community and makes the community become an organization of high cohesion, thus the members are willing to contribute their own strength to this community.
- (2) User: the people who are ready to take part in WP2PECCM in real life. Teachers and students are both belong to user.
- (3) Played role: the role of participants in WP2PECCM. From above paragraphs, we have known that different teachers own different advantages and disadvantages. We can use this point,

thus in our system constituted by teachers of a school or a region, a teacher can act as a “teacher” to teach his known things to his fellows, also, he can become a “student” to learn new things from other members. A user can own double-identity (“teacher” & “student”) at one time, which differs from most other network education platforms. They only allow one user to have one identity, either “teacher” or “student”.

(4) Activity: When a user register to WP2PECCM, he will automatically own this particular double-identity (“teacher” & “student”) and conveniently teach or/and learn using this platform. In addition, he can communicate with other users (perhaps his student or teacher in one course).Also he is entitled to make use of course management tool to engage in various classes and freely switch in the double-identity (“teacher”& “student”).

(5) Relationships in the community: the relationship formed between the individuals, between the individual and the organization.

(6) Supporting services: the tools and services provided by WP2PECCM which are helpful for the teaching and studying activity, such as course management, materials (related resources uploaded by users), user management, news and video uploading system, communication tools, etc.

III. IMPLEMENTATION OF WP2PECCM

We create the www.sayputonghua.com site.



Fig. 3 www.sayputonghua.com Homepage

It contains about 8 sub-systems: Video sharing, Blog, Event, group, Site News, Forum, P2P Live Education, and White Board.

A. Video sharing

Videos are uploaded to our site by the administrator to show our education progress, they are mainly the records of the face 2 face teaching.

B. Blog

The members (teacher & student) can submit their blogs to share their experience.

C. Event

We develop a very important part called “Event”. Users can create a date with others, such as a date about next Monday morning language learning. It contains following element.



Fig. 4 Page of “Event”

- Title - The event title.
- Description - The event description.
- Status - Active, Inactive or Cancelled.
- Status message - Reason for the change in status.
- Venue photo - Photo to show what the venue looks like.
- Event date - Details such as the event start and end.
- E-mail and phone information.
- Event participants - details relating to sex, age, membership
- Member side options -Filter to allow members to view participants list.

D. Groups

For the users classification, we add the group function, user can attend join the group which he like, and share experience in the group.

E. Site News

We also provide the news function for the website; administrators can post the latest news for users.

F. Forum

We develop an Ajax based real-time forum. It gives users updates as posts are made and the posts are displayed on the main page.

G. P2P Live Education

P2P Live Education allows members to communicate with one another using video and chat based on P2P technology. As a core part, “P2P Live Education” plays a crucial role on the eLearning platform that simulates the real face-to-face class and enable teacher to instruct students as they do in the real classrooms

Teacher can speak, ask students to answer questions as usual. Students can listen to the teacher, put up hand to ask a question and they can even whisper with others in our system.

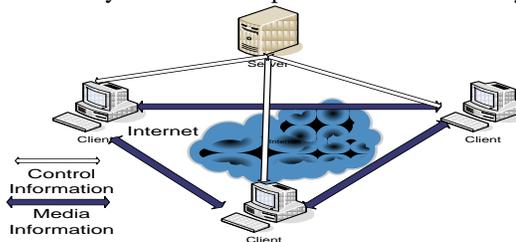


Fig. 5 Communication between clients

- There are 5 key areas in the chat. They are:
1. Main chat screen - Shows the real video from another user.
 2. Chat message send text area - Messaging area that allows you to send a whisper to a member or engage in the group chat.
 3. User self image- Show the real video from himself.
- User can:
- Select the input device
 - Select the encode of the audio and video.
 - View the statics of the video and audio

P2PEducation

Please make sure you are using flashplayer 10.0

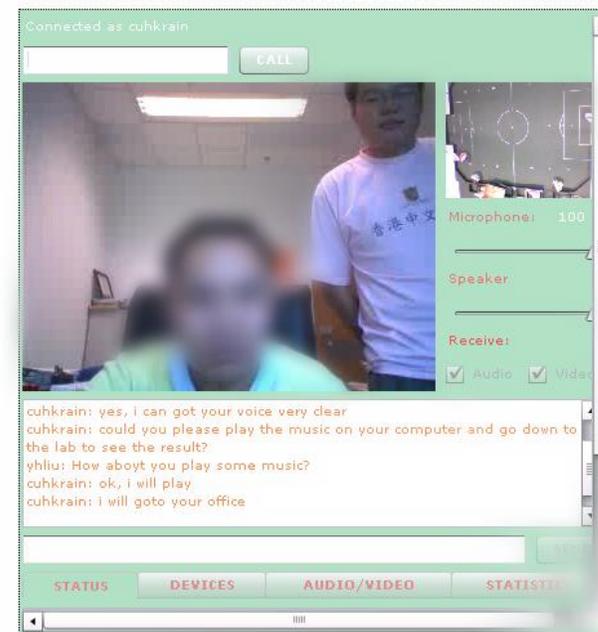


Fig. 6 Interface of clients using P2P Education function

H. White Board

It is a mouse based operated system integrated to P2P live class. It can help the student know the order of the Chinese character. Just like following fig showed.

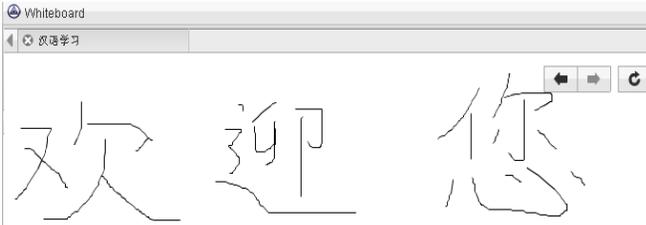


Fig. 7 Interface of clients using White Board function

IV. KEY TECHNOLOGY OF WP2PECCM

A. P2P Transmission Protocol Selection

For developing the web-based education system, we choose the Adobe Flash Player 10 and Adobe AIR 1.5 to support our design, because Flash Player is already the market leader in online video distribution over the web. They support a new communications protocol, Real-Time Media Flow Protocol (RTMFP), whose low latency, end-to-end peering capability, security, and scalability make it especially well suited for developing real-time collaboration applications by not only providing superior user experience but also reducing operators' costs.

Two clients communicate directly without passing their data through the server for low-latency, real-time communication. This is the why that our system chooses RTMFP. RTMFP is essentially based on the idea that real-time video or voice interaction between two users of Flash or Air applications shouldn't have to deal with the latency and bandwidth burden of a server-based relay. It's just faster and cheaper to let the persons talk amongst themselves. We set up a central server to authenticate users and facilitate the exchange of the data, but the actual video streams flow directly between the users of the application.

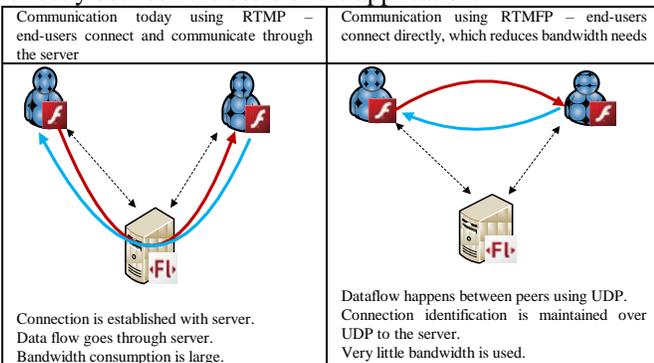


Fig8. Advantage of the RTMFP comparing RTMP

One of RTMFP's major differentiators from Real-Time Messaging Protocol (RTMP), which is based on the Transmission Control Protocol (TCP) and exclusively used in previous versions of Flash Player, is that RTMFP is built on User Datagram Protocol (UDP).

UDP is an efficient Internet protocol to allow partially reliable (loss) delivery of media and data. UDP, unlike TCP,

does not try to recover data that has been lost in transmission. This allows video and audio to keep up with live, real-time communication and reduce delay caused by latency, which is a priority for these types of real-time solutions. TCP waits for packets that can cause delays or interruptions in the delivery. UDP can also supports direct peer-to-peer communication in networks served by Network Address Translation (NAT) routers.

V. CONCLUSIONS

In this work, we adopt peer to peer (or "P2P") thoughts to build this model of WP2PECCM model. Each participant who enters the WP2PECCM automatically owes double-identity--not only be a teacher" but also be a "student", so he is both an information provider and an information absorber. They can interact freely and equally according to their actual needs, which is benefit for constructing the atmosphere and environment of cooperative learning and achieving the desired learning effect.

We also present the implement with the development of WP2PECCM. Users can communicate with one another using video and chat based on P2P technology that simulates the real face-to-face class and enable teacher to instruct students as they do in the real classrooms. Teacher can speak, write on the white board, ask students to answer questions as usual. Students can listen to the teacher, put up hand to ask a question and they can even whisper with others in our system.

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