A Multimedia System based on Cloud Computing

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Abstract: This study mainly introduces the principle and framework of Cloud Computing and designs a new multimedia system based on cloud computing platform. What's more, the system was designed with the security, low cost and fast advantage of cloud computing and the application of 3G or WLAN (Wireless Local Area Network) technology. And it is improved through analyzing merits and drawback of current multimedia teaching system. The system consists of mobile terminals, cloud computing platform and projectors, in which the application of Cloud platform is the emphasis of system design. The system can provide teachers a convenient teaching environment and teaching equipment will be greatly simplified with the system.

Key words: Cloud computing, multimedia, WLAN

INTRODUCTION

As a part of information technology application, classrooms equipped with multi- media system are popular more and more. In the traditional multimedia teaching, system structure is shown in Fig. 1 (Fang, 2012).

Generally carry out multimedia teaching by the projector etc., the interactive multimedia teaching system has problem such as having too much equipments, is difficult to maintain and upgrade etc. Following the development of cloud computing technology and 3G communication system or WLAN, the shortcomings mentioned before could be avoid. 3G as new communications technology standards is currently the most well-known in China, increasingly wide range of applications. Generally speaking, 3G as a new generation of mobile communications systems which combines wireless communications with Internet and multimedia communications. Through the 3G network or WLAN, the mobile terminal can communicate with the Internet to quickly realize the access and control the Internet resource.

With the development of parallel computing, distributed computing, grid computing, a new computing model appeared (Zhang *et al.*, 2010). Cloud computing is a new information technology trending that moves computing and data away from desktops and portable PCs into large data centers. The basic principle of cloud computing is to deliver applications as services over the Internet as well as infrastructure. A cloud is the type of a parallel and distributed system consisting of a collection
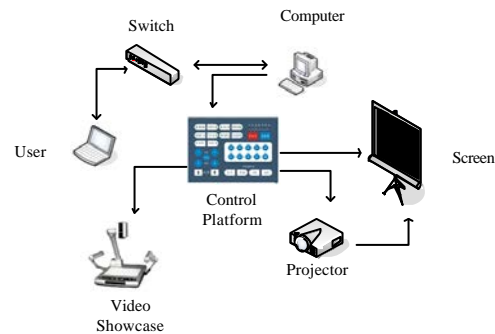

Fig. 1: Structure

of inters connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources (Kang *et al.*, 2010).

Cloud computing bring the disrupt resources together to form a resource center through the network and provide convenient service on demand anytime and anywhere. Cloud computing architecture can be divided into three layers: Infrastructure as a Service layer (IaaS), Platform as a Service layer (PaaS) and Software as a Service Layer (SaaS). IaaS provides hardware infrastructure deployment services which provides users with on-demand storage, computing and network resources, etc. PaaS provide running environment for applications in the cloud computing and provide users with application deployment and management services. SaaS is applications based on the cloud computing and provide users with software services (Luo, 2012).
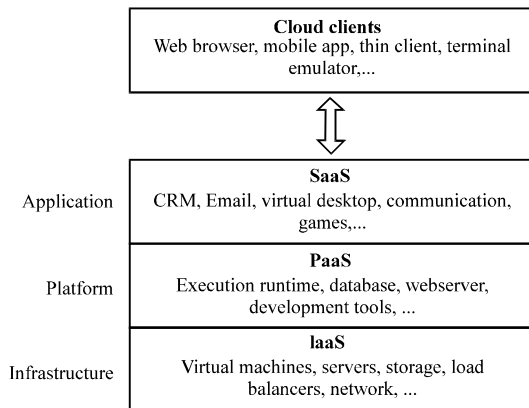
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| **Cloud clients** |
| Web browser, mobile app, thin client, terminal emulator,... |

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	SaaS
Application	CRM, Email, virtual desktop, communication, games,...
	PaaS
Platform	Execution runtime, database, webserver, development tools, ...
	laaS
Infrastructure	Virtual machines, servers, storage, load balancers, network, ...

Fig. 2: Cloud computing platform

Cloud computing platform scheme is shown in Fig. 2 (Mell and Grance, 2011).

SYSTEM MODEL

As previously mentioned, development of Cloud Computing and 3G technology or WLAN technology to promote, a new multimedia teaching system is proposed in this study. The new kind of teaching system is a projector only and the projector is a terminal of cloud computing. The control tool is mobile phone or other mobile terminals. There are no multimedia computer, no control plat form and no special power support. In this way, the user does not need any data media.

Traditional system shortcomings: Besides the several problems proposed above, there are still some shortcomings in conventional multimedia teaching system.

There are too much equipped in each classroom and a mount of equipment usually takes high maintenance costs and power consumption.

Each user needs bring a removable storage device, copy the data to the host, it is not very convenient.

The device in the classroom is much more vulnerable by dust pollution which the equipment can be easily damaged. The hardware needs to constantly upgrade.

Model of new system: The advantages of the new system are obvious. This section will first introduce the original system and provide the methods and procedures of transformation to the traditional system.

Structure of common conventional multimedia system is shown as Fig. 1. It is consists of the control system, computer, projector and other function components. As previously described, the traditional system requires the

use of consoles, computers and related peripheral equipment, etc. which causes an unnecessary burden for maintenance and upgrade. Therefore, there is not need a computer for a new teaching system, just use the mobile terminal instead.

Multimedia computer is the core of the system to demonstrate which in charge of running teaching software and largely determine the quality of teaching performance and presentation. With the mobile terminal handling capacity improving increasingly, mobile terminal can be used to replace computer equipment in effect. It is resulted in reducing the size of the equipment and improves the flexibility of the teaching. If the traditional system wants be transformed, this can use mobile devices plus cloud platform to replace the control platform that using computer as the core. In this system application of network is very important, the process of creating connection between the projector and Cloud platform also need through the network to achieve. For those projectors which can be extension, as long as embedded the corresponding product network modules that can accomplish preparation of connected to network.

The system network architecture of a multimedia system based on cloud computing and 3G communication technology is shown as Fig.3.

As shown in Fig. 3, the structure is much simpler than traditional system's obviously. And the application of WLAN provides the new system condition to accomplish. WLAN can achieve LAN networking for school campus and share resources, provide high quality integrated information service for business (Yu, 2012). In this system, mobile terminal is the controller of multimedia teaching, Resources is a logical part included in Cloud system and the projector in classroom is also a terminal of the cloud system.

Utilizing cloud computing technology, a multimedia teaching system can be built easily. From Fig. 3, the system includes three parts:

Construct a data center with education resources. The data center is built by cloud computing technology and can manage large scale software and hardware resources, such as network based design and simulation tools, course material, course preparing platform, network based experimental system and so on. The user can build a private and virtual PC in the data center and prepare and edit course material and experimental system.

Build a classroom projector system based on network. This means that the projector must be a data receiving terminal. The projector system can receive data from campus data center and display on screen.

Design an API for 3G communication terminal. This work will make a 3G terminal becomes a data terminal of
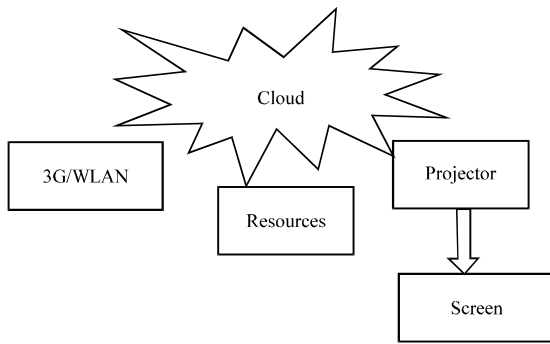
Fig. 3: Network scheme

the data center. The terminal is a virtual PC which has the same function of the PC used in multimedia teaching now.

Advantages of new system: Such multimedia teaching system based on cloud computing and 3G communication technology has 3 characteristics as following:

- **Virtualization:** Cloud platform will allocate the resource to many users which were belonging to a user by virtualization technology
- **Rational allocating:** The platform assigns resources according to the different needs of users which improve utilization of resources
- **Ubiquitous access:** Users can use the terminals to access the cloud platform via the Internet or a local LAN, anytime and anywhere which is fast and convenient

DESIGN METHODS

To accomplish entire function of new system, this study introduces basic principles and methods briefly to achieve desiring.

- **cloud platform:** Cloud platform is the top priority of the entire system, is the most central and critical modules. The biggest advantage of the cloud platform is integrating of resources, can make complex task decompose into the cloud platform, improve efficiency and save time. In this system, the cloud platform for the main function is applied for a virtual hosting service which is able to complete all the work done as ordinary computer. But it unlike most computers will be restricted as by its own resources and speed constraints.

As shown in Fig. 4, the software in cloud platform requires completion of three functions in this system
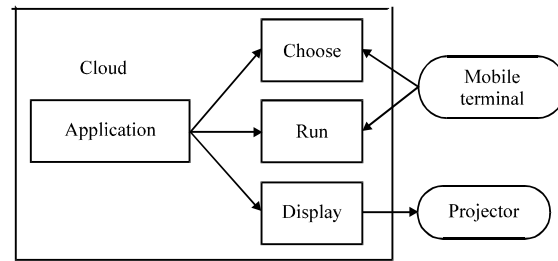
Fig. 4: Function of cloud computing

which contains select the file, run the file and display the content to the projector. Before class, teachers can copy teaching files into their own cloud platform applications through, or directly create and edit teaching files. It can be demonstrated in the class once teachers need to run the file, whether word, ppt office files or video, it can be display onto the projector.

Projector: Most traditional projector use VGA interface to connect with computer equipment. It requires relevant installed environment which improve the difficulty of use. To avoid this drawback, the system uses the network connection device to connect with the computer, eliminating the tedious process of connecting. Whether the projector support network function itself can use the system.

Implement of the network connect mainly through the projector application on the LAN IP address (the IP address can be a gateway to connect the projector automatically assigned). The IP address of the projector is equivalent to a unique identifier that can be used to identify by computer equipment. Most projectors can be achieved through the driver that comes with the IP access network capabilities and network connectivity.

Mobile terminal: In this system, users can use mobile phones or other mobile terminals to operate. The mobile terminal built service in Cloud platform (Huang, 2012). The cloud via a network connection with a two-way communication platform will be able to operate on the cloud platform. It is as same as use the common computer to operate cloud platform resources. Of course, this function is implemented on the mobile terminal must install the appropriate operating software.

TEST AND IMPLEMENTATION

Process of operation: As control software of cloud platform, it mainly has to achieve two functions. The one is connected to the projector so that transmit current state of the platform onto the projector. It means that the
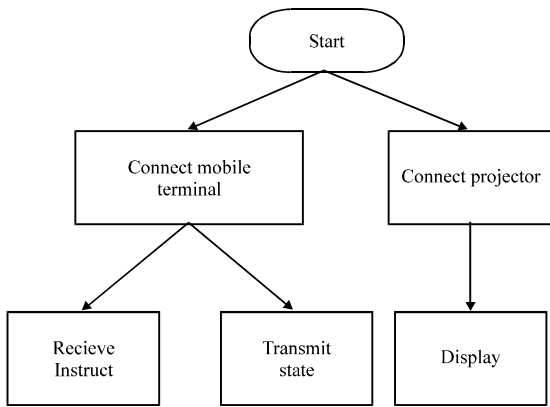
Fig. 5: Software of cloud platform

projector is another cloud platform as a display screen. The other is to establish two-way connection with the mobile terminal, transmit the real-time status cloud platform to the mobile terminal and receive mobile terminal operation control instruction. The software structural design is shown in Fig. 5.

After the program starts, the first to establish a connection with the mobile terminal through predefined account name to find the control terminal and provides control permissions. When connection is successfully established, the program has two separate activities, a control terminal for receiving instructions and transfer to the main activity to complete cloud platform operation. Another activity used to update the status of the current state of the cloud platform is sent data to the software of mobile terminal.

When the above steps were accomplished, the program will start with the projector connections through the current IP address of the projector to connect. While the connection is successful, the state of activity is used to transmit the state of the cloud platform will be sent to the projector. Consequently, it can complete the displaying of the current state of the cloud platform.

Test result analysis: Firstly, the platform is the key which affects the whole system. In the platform, the virtual machines can be online always. Secondly, connect the virtual machines with mobile terminals, in which the client software is installed. Then the mobile terminals can control the virtual machine, where server software is installed. We can connect the projector by the mobile terminal. There is the basic function menu of system in the Table 1.

In the process of testing, the result is the same as respected basically. If there some virtual machines, we can choose one of them to access in the main interface. And it is convenient to control the resource in the platform.

Table 1: Basic function menu

Access to virtual machines with username and password anytime and anywhere
Connect the projector with IP address or projector name
Resource management

When control the file in the platform by phone, the projector can project out the pictures at the same time. However, there is little delay in the mobile terminal. And the sound is transferred to terminal but not the projector. The low network speed is responsible for the delay in the mobile terminal. The pictures could not be sent to the mobile terminal in time. As for the sound, it should not be conveyed to terminal but multimedia system.

CONCLUSION

In this study, the new system can applied to circumstance in current and simplified the equipment of teaching condition and it also reduces a great of device facility installed. Although the new system makes great progress compared with the traditional system, there are still some limits. This system not only needs to promote cloud platform support, but also demand projector has network function. Besides, the terminal need connect to cloud computing platform via 3G network. If the internet speed is low, the terminal can't get the resource from cloud platform in time which results in out-sync of the projector and the screen of the terminal. In addition, for those projectors whose manufacturer does not provide network extensions, how to add them adaptive embedded module to provide network connectivity is also a problem. Therefore,Further research is needed to solve the existing problem or limitations.

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