

Application Exploration of Elastic Cloud Server in Experimental Teaching Platform

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Abstract. In the case of normalized epidemic prevention, online and offline hybrid teaching presents obvious development momentum. In such an environment, the traditional experimental teaching platform has many weaknesses such as frequent software failures, difficulty in upgrading and performance insufficient. Therefore, there is an urgent need for a kind of education platform that reduces the difficulty of using engineering teaching laboratories. ECS and cloud remote desktop can centralize management computing and data resources of the course whose name is industrial robot operation and programming. They can also diversify system software, automate laboratory management and real-time software version update. The software and network failure during the use of the computer is reduced. Students can access the school's virtual simulation laboratory resources anytime and anywhere. The utilization rate of virtual simulation laboratory platform and the teaching quality of experimental courses can also be improved.

Keywords: Elastic Cloud Server, Desktop as a Service, Laboratory Course.

1. Introduction

In order to cope with the development trend of global integration, especially trade friction and the outbreak of the severe situation, in line with international standards and improve students practical ability, play to secondary vocational college advantages and strengthen overseas Chinese vocational and technical schools in Guangdong province in discipline construction, construction has a special engineering teaching laboratory, to cultivate students' practical operation ability such as different disciplines and different courses [1]. Some courses need to install different versions of software, such as AutoCAD, Visual Studio, MATLAB, Robot Studio and other large platform software. The installation configuration of such large engineering application software is more complex. After the installation of a variety of software is prone to conflict due to functional overlap, hardware resource independence and other factors, resulting in leading to software failure. Therefore, the management situation of engineering laboratories is more complicated. Management is inefficient. In addition, due to the arrangement of the access course, some laboratory occupation in the first half of the academic year and the second half of the academic year is completely different, and even some professional self-built laboratories are completely idle for a period of time, leading to a serious waste of laboratory resources and equipment [2]. Therefore, it is necessary to explore a new training method for engineering experimental courses, improve the utilization rate of some experimental equipment, reduce the labor intensity of managers, and improve the teaching efficiency of teachers and students' learning efficiency.

2. Characteristics of the ECS in the experimental course

Cloud computing is currently a popular business service. Cloud computing (Cloud Computing) is an internet-based computing method, through which shared software and hardware resources and information can be provided to various computer terminals and other devices on demand. ECS (Elastic Compute Service) cloud server is a kind of business model, using the cloud desktop way to connect to the cloud platform for remote operation. Cloud platforms generally provide four modes of service. One is the IaaS infrastructure as a service, remote users can access services from a well-

established computer infrastructure via Internet, Usually IaaS service providers combine several IaaS services, Tell IaaS users what products and services they can provide in the form of a product catalog. The second is the PaaS (Platform-as-a-Service) platform as a service which generally aims at Internet application developers, treat end-to-end distributed software development, testing, deployment, running environment, and complex application hosting as services. Relying on the IT infrastructure cloud platform has freed developers from complex and inefficient environment construction, configuration, and maintenance efforts, improving the efficiency of software development. The third is SaaS (Software-as-a-Service) software as a service. It is a mode of providing software through the Internet, users do not need to buy the software. Instead, renting Web-based software from providers, to manage the school teaching and other activities. Over traditional software, SaaS solutions have obvious advantages, including low early cost, easy maintenance, rapid deployment and use, fourth, DaaS (Desktop-as-a-Service) desktop as a service, desktop as a service to end users through cloud computing. With the IaaS architecture and desktop virtualization technology, you can build your desktop on the IaaS architecture and distribute the desktop to the end user through the desktop virtualization protocol. DaaS works by hosting a large number of virtual machines running desktop operating systems in the data center, and using some remote display protocol to provide remote access to these virtual machines. No matter what kind of terminal users use, users are faced with a familiar terminal desktop [3].

The Laboratory of Mechanical and Electrical professional Department of Guangdong Overseas Chinese Vocational School serves as an engineering teaching and experiment platform, undertakes the students' computer information experiment platform includes computer program zoning, formatting and other general training. It also includes the installation and maintenance of large professional software of some professional courses, so IaaS platform can be selected as the infrastructure, operating systems such as Windows and Linux can be installed, on this basis, SQL Server, Oracle, RobotStudio, Visual C++, online learning programming system and other platform software are installed to form a PaaS platform, some application-class software can also be installed on this platform, including chrome and firefox, wps office, text editor, development assistant software to form the SaaS platform, Using a DaaS streaming desktop push to terminal teachers and students, completes the course training tasks by better using different software from different platforms [4]. The cloud service hierarchy diagram of Ali Public Cloud Experimental Teaching Platform of Guangdong Overseas Chinese Vocational School is shown in Table I.

Table 1. Cloud service hierarchy diagram of Ali Cloud Experimental Teaching Platform of Guangdong Overseas Chinese Vocational School

Guangdong Overseas Chinese Vocational School Ali public cloud experimental teaching platform	cloud services	Representative, service
	DaaS	Ali Cloud desktop, Microsoft remote desktop
	SaaS	chrome, online learning (boutique class) platform, online examination platform
	PaaS	SQL Server, Oracle, RobotStudio, Visual C++, Online Learning Programming system
	IaaS	storage, computing, network, Ali cloud virtualization platform, operating system

3. Implementation and application exploration of ECS in the experimental class

3.1 Laboratory scheme design based on Ali Cloud desktop

At present, the school recruit students in addition to local students in Guangdong province, there are part of foreign students, in addition, some school teachers with foreign schools have teaching or academic exchange, at the beginning of ECS choose and buy, will consider the needs of cross-border access platform, focus with international IDC acceleration service ECS as a laboratory teaching

platform. By visiting and investigating the existing cloud platform construction cases of other universities such as the School of Mathematics and Information of South China Agricultural University, comprehensively considering the obtained funds and follow-up investment, improving the efficiency and ensuring data security, and choosing a more suitable Ali Cloud desktop.

Laboratory terminal uses old PC installation cloud desktop landing software. Cloud terminal is connected to convergence layer switch via a network cable; convergence layer switch is connected to core router via optical fiber, and finally connected to Ali Cloud VDI server via optical fiber [5]. The design diagram of cloud desktop laboratory architecture is shown in fig.1.

3.2 Experimental course construction scheme based on Ali Cloud desktop

First, the construction of the "Industrial Robot Operation and Programming" resource database. The course of Industrial Robot Operation and Programming is an old course of Guangdong Overseas Chinese Vocational School. After many years of accumulation including many resources: ① PPT courseware, Multimedia courseware including textbooks and reference materials, teachers to teach courseware, etc.; ② WORD documentation and PDF reference textbook documents, etc, including lesson plans, teaching references and course cases collected by teachers; ③ C language and C ++ language program source code, including the codes of industrial robot operation programming, after-school exercise and source codes developed by the teachers themselves; ④ Audio and Video Files, including the teaching video of teachers, case resources, the latest research on audio and video at home and going abroad; ⑤ Flash Library, although the current Flash technology is no longer updated for maintenance due to the long construction time of this course, resources are relatively rich. It cannot temporarily be completely replaced, therefore, the platform must be able to run the Flash test question library; ⑥ Course Professional Software. Including ABB company software of RobotStudio robot virtual simulation, Visual C ++ 6.0 software development and operation of C and C ++ source code, industrial robot integrated experimental platform software (the platform software can only run on Windows7 operating system), and robot examination system platform software. According to the above software characteristics, Ali Cloud desktop client needs to adopt Windows7 operating system, compatible with old software and experimental platform. The server can push documents, streaming media audio and video functions at the same time, and adopt hybrid architecture with front and rear separation.

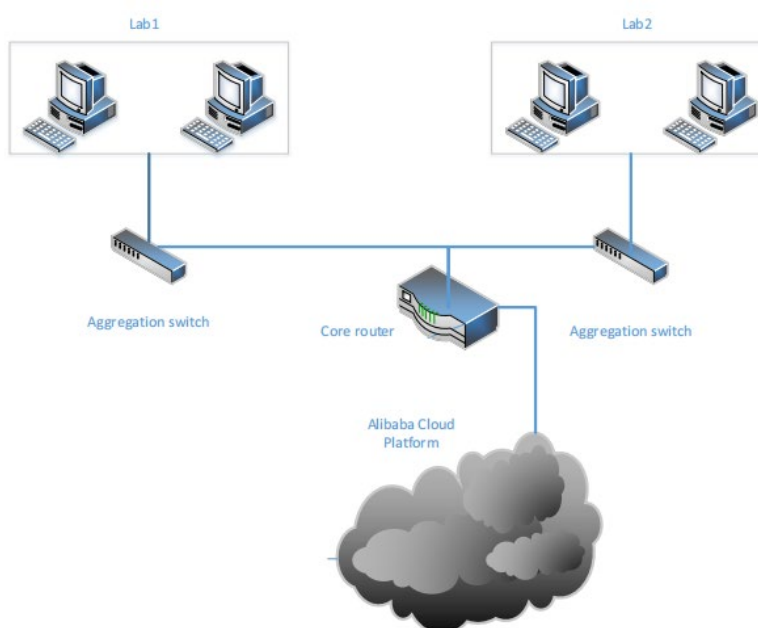


Figure 1. Design diagram of Ali Cloud desktop architecture of Guangdong Overseas Chinese Vocational School

Second, the experimental software remote desktop stream push. There is many platform software required for the course of Industrial Robot Operation and Programming. Pushing an APP alone will lead to the separation of the teaching process, and the effect is not good. Therefore, the desktop push service of Ali Cloud desktop can be directly used to directly project the whole cloud desktop to the client. Students use PC machines, mobile phone terminals, tablet computers and other handheld devices to install Ali Cloud desktop or Microsoft remote desktop, which can access and push the cloud desktop by flow. Depending on the effect, Ali Cloud Desktop needs to guarantee the bandwidth of about 5Mbps under the 1080P effect, when the bandwidth is below that value, large ks of mosaics appear across the desktop, impact the user experience, transient burst bandwidth can reach 9Mbps, And Microsoft's remote desktop bandwidth footprint, generally, from 40Kbps for normal mouse click operation to 20Mbps for full-screen streaming video, users can choose to accord to the actual needs. If you do not watch the streaming video, it is generally recommended choosing Microsoft remote desktop effect. It is the lower amount of network bandwidth which is occupied.

Third, the experimental course evaluation of Industrial Robot Operation Programming. ① From the perspective of teaching supervisors and management personnel, because the whole experimental process is completely controllable, the whole course can be played back, and the analysis tools provided by Ali Cloud can be used to horizontally compare other similar courses, such as the Internet of Things Technology and Application, to give more scientific and reasonable suggestions.② The whole experimental course from student login, according to the course time to complete different experimental task node, students start task time, task time, task rates, etc. can be intuitive from the teacher, teachers can accord with the progress of each student, targeted guidance, improve students' enthusiasm for learning.③ The whole experimental course only needs to use the cloud desktop anytime and anywhere can login system for learning, teaching video can playback anytime and anywhere, experimental software can open the computer and mobile phone anywhere, to avoid the students making an appointment in advance, on time to the room, improve the school to buy expensive software, effects rely on classroom 45 minutes of experimental teaching are far from reach. Experimental courses are limited by students who do not have experimental equipment and generally cannot do homework. After using Ali public cloud platform, students can continue to practice in the classroom, dormitory or home, and students have a high degree of the course tasks. ④ Before the course evaluation ranking in the last few, lead to experimental course no teacher is willing to take over, through the Ali cloud platform, using modern information, evaluation to medium, after the cloud platform with more and more resources, based on cloud desktop experimental course design is more and more perfect, believe the platform will let more students like.

4. Trial effect and analysis of ECS in engineering experimental courses

Through the Guangdong Overseas Chinese Vocational School electromechanical department laboratory introduced ECS and a cloud desktop, and after the robot operation program course for a period of trial, students in the experimental course laboratory such as operating system problems and network security problems basically disappeared, students no longer complain about experimental environment such as the old operating system, old software version, cloud platform operation is relatively stable. ECS and cloud desktop technology joint application, cannot be affected by different batches of different types of computer unified configuration deployment, for different teachers use their experiment environment, even for different teachers customized different software version without considering the problem of compatibility, students can operate on their mobile phone anytime and anywhere, improve the students' interest in learning and experimental frequency. Although there are many advantages in building ECS in engineering laboratories, the following problems are also found in the actual operation:

First, the bandwidth and the number of concurrent links requirements are high. The Industrial Robot Operational Programming course has many case videos. Each virtual desktop has at least a stable bandwidth of more than 5M bps to ensure the smooth full playback of the course video screen.

Usually the examples of 45 sets, if instance 180 clients land in the cloud at the same time, considering the partial allowance, then at least 1Gbps of bandwidth are required. The current export bandwidth of the machine room is double ten trillion megabytes. However, the school export bandwidth is 11Gbps (China Telecom + Education Network), if a large number of students watch online videos at the same time, easy to lead to insufficient bandwidth, some students are not easy to log in, you can consider gradually extending the performance in use.

The second is not fully compatible with some software. For example, Industrial Robot Operation Programming comes with online programming examination software. Due to the need to use encryption dog software, it will fail when distributing the test paper authorization. The software is officially confirmed that it cannot be used on the ECS cloud platform. In addition, when the normal installation of Tianyi Cloud conference software for online teaching, double-click to open the software failed, the interface flashed by, the software was confirmed by the official subsequent upgrade solution or temporarily turned off the hardware rendering function.

Third, the ECS cloud platform for some large 3D graphics computing support is not particularly good. For example, the course of Industrial Robot Operation Programming uses 3DMAX. The reason is that limited by the procurement cost, the education cloud platform does not use a high-end graphics card with v GPU direct-through function, resulting in a slightly insufficient 3D performance, which can be gradually expanded in the future use.

Fourth, the amount of data on the cloud platform surges, leading to problems on the cloud platform or other situations that need to move out of the cloud. It may also be more troublesome to move data from the cloud. At present, the cloud platform has been running for a period of time, generating about 10T of data, while the cloud data is charged according to the bandwidth or traffic, and the monthly bandwidth is generally relatively low. If you need high bandwidth, you need to charge according to the traffic. Now there is a high cost of data migration.

5. Conclusion

Using Ali public cloud platform construction experimental course, compared with the traditional self-built experimental machine room, although the compatibility needs to be improved, network rates are high, disadvantages such as large data traffic. However, with the implementation of the national network "speed increase and a fee reduction" and "5G" projects, these shortcomings will all be addressed in a short time. But the cloud platform has centralized management of computing and data resources, teaching system software diversification, advantages of teaching a software version, convenient means brought by a cloud desktop to management personnel, bringing diversified teaching means to teachers and students, it actually reduces the management workload and maintenance costs, improved the teaching efficiency of teachers.

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