An Investigation on the Integration of CC and IOT Education Resources in Military Academies

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Abstract - Cloud Computing and the Internet of Things are both developing rapidly in recent years. The military academies should also seize this opportunity to realize the integration of education resources in the Cloud Computing and the Internet of things environment effectively. In this way, the integrated combat capability construction and the development of military theory could be improved. By illustrating the connotation, function and characteristics of Cloud Computing and Internet of Things, this paper analysed the impact of Cloud Computing and the Internet of things on the integration structure of education resources in military academies. A integration model of military education resources in CC and IOT environment is put forward in this paper, along with some related problems that claim special attention..

Index Terms - Cloud Computing, Internet of Things, military university, integration of educational resources.

1. Introduction

In 2006, Google and Amazon put forward the concept of "cloud computing"(CC). In February 2009, the American "Federal Cloud Computing Technology Forum", the chief information officer of the Defense Information Systems Agency Gering puts it: "Cloud computing is the driving force of the Ministry of Defenses, we must do something on the cloud computing."[1] And the Internet of things is called the third wave of the information industry after the computer, Internet and mobile communication network. In 2010, this is written into the Chinese government work report formally, which represents the new development in the national top strategic design. As the two kinds of emerging information technology -- cloud computing and the internet of things, is the core driving force in the future competition and industrial upgrading, the integration of the two technology will exert a profound influence on the economic development and social life. When this combination is applied to the military field, it is certain that both the military information construction and the combat operation would change greatly, followed with a new revolution in military affairs.

2. Helpful Hints Understanding of Cloud Computing and the Internet of Things

A. The "cloud" in CC

Cloud Computing (CC) is the development of Parallel Computing, Distributed Computing and Grid Computing. It is a way to realize the on-demand and extensible obtaining of the required hardware, software, and other resource service platform through the Internet. Dr. Zhang Ya-qin, the senior vice president of Microsoft global Corp, made this interpretation of Cloud Computing. The mode it advocate is: polymerize data, service and all of the hardware including CPU, memory, network and software, construct large scale data and application Center, in order to avail personal and business users to visit, share, manage and use related resources through the Internet[2]. The "cloud"in CC can be a "public cloud" as well as "private cloud". As to the operation mode of Cloud Computing, it makes use of the transmission capacity of high-speed Internet to transfer the process data from a personal computer or server to a computer cluster on the internet. The computer cluster is managed by a large data processing center. The data processing center will allocate the computing resources by the need of the clients, which is equivalent to the use of a supercomputer.

B. The IOT

The concept of the Internet of Things(IOT) originally come from the radio frequency identification (RFID) system proposed by the Auto ID Labs which is established by Massachusetts Institute of Technology (MIT) in 1999. In 2005, World Summit on Information Society (WSIS) held by the International Telecommunication Union (ITU) identified the concept of the "Internet of things" formally, and subsequently issued "*ITU Internet Report 2005: the Internet of things*" [3]. The Internet of Things is a network in which we apply radio frequency identification (RFID) system, infrared cameras, laser scanners, sensors and global positioning system, wireless communication system and so on to connect goods (such as equipment, facilities, a variety of goods and even human and animal, etc.) to the Internet as agreed in the agreement. In this way, people and objects, objects and objects can exchange information and communicate with each other. Thus we can realize the intelligent recognition, positioning, tracking, monitoring and management of objects. In short, the Internet of things is the combination and integrated application of a variety of information technology, which creates a world of wisdom that enables intelligence dialogue between people and objects, objects and objects.

C. The combination of CC and IOT

"The future world must be an intelligent virtual world, which is also the world of Cloud Computing and the Internet of Things."[4] There are some experts who vividly described as follows: Cloud Computing is just like the human brain, and the Internet of things is like the facial features and limbs of a person. With the combination of the IOT and CC, we can achieve more goals efficiently, flexibly and conveniently. The

Internet of things has three prominent characteristics: overall perception, reliable transmission and intelligent processing. Intelligent processing needs to analysis and process masses of information to realize the implementation of intelligent control of objects. Cloud Computing is just equipped with such ability. One of the successful applications of Cloud Computing is "Google search engine". Its data is distributed in each data storage centers around, when the client sends a search request, the search engine can launch the search process concurrently, rank the data from thousands of computers and give feedback to the client. With the cheap, ultra large scale processing power and storage capacity provided by the Cloud Computing center and the real-time information collection provided by the Internet of Things, the combination would give people an opportunity to sense the scene described in "Afanda" that all the creatures on the planet are linked together.

3. The Influence of CC and IOT in the Integration of Military Academic Education Resources

In the "*Anti Dulin Theory*", Engels pointed out that once the technical progresses can be used and has been used for military purposes, they would immediately and compulsively change the combat operation mode in a way that even the commander will not be able to control. The birth and development of CC and IOT technology make it possible for the army to break the traditional military thinking and improve the information construction level. Especially for the development of educational information technology in military academies, the application of CC and IOT will remove the obstacles for the pressing educational resources integration and provide new opportunities for development.

A. Current situation

Military academies in China have accumulated a variety of military education resources after decades of construction and development, there is an urgent need to integrate existing resources effectively in order to reduce idle situation and thereby improve the overall efficiency. However, there still exist many problems that restrict the smooth integration of educational resources in the process of military academy education resources construction. First, it is the shortage of education funds. Educational resources integration needs funding support, but the military education investment is too low and the education funding shortage phenomenon is still severe. Research shows that, in majority military academies, education funds can only meet 60% of the basic teaching requirements and the average expenditure is even lower [5]. At the same time, the constantly update and adjustment of existing educational resources call for more investment, which brings great pressure to military academies. Second, it is the scattered education resources and uneven distribution. Military academies in our country are relatively independent, which inevitably leads to the redundant construction of subjects, teaching crews and equipment. The construction of educational resources is also limited by the individual strength of different military academies which results to an extremely imbalanced development situation. Some colleges have been exploring ways to achieve the sharing of limited resources by integrating educational resources through various modes actively. However, many institutions still have not work on the reorganization of resources, regardless of the defects of independent development. Furthermore, it is imperative for the management mechanism to be perfected and the sharing degree of educational resources requires to be improved. Some units are still confined to the traditional "provide for oneself" mode in the allocation of internal resources. And the integration of resources they work on is simply merge different resources together which fails to achieve a fundamental change in management. In addition, although Internet and distance education promoted envelopment and integration of the curricular software resources in a certain extent, the hardware resources still can't be shared and thus made full use of.

B. New opportunities in CC and IOT environment

The features and functions of CC and the IOT were exactly to the benefit of solving the problems and obstacles faced in military academy education resources integration. On the one hand, the CC and IOT environment may help to reduce the education funds in both hardware and software aspects. The Cloud Computing is able to combine the RAMs, memories and computing abilities of many distributed computers to form a virtual Resource Pool, as well as offer the users practical computing services through the Network. In addition, the related supplier would be responsible for the upgrade and maintaining、edition controlling of the software, resulting in no more vast funds to purchase the authorization of the commercial software. The Internet of things connects all the things to the Network, using kinds of information devices, to offer convenience to identify and manage, and also to make different kinds of education resources "in good time, in good position and in good quantity", and finally realize more flexible dynamic and self-adapted resource support. On the other hand, the CC and IOT environment may help to narrow the difference of the education resources development in different academies. Different colleges would be able to share the same allocated teaching, researching and experiment environment through the CC and IOT service in the future. Some without advanced hardware and software devices and fine computing abilities could help teachers and researchers to keep in touch with the international advanced subject technologies and scientific research platform at a very low cost, and also to lay foundation of fostering more advanced talents for the military academies. Besides, with the IOT in the support of the strong "Cloud", different kinds of education resources could be stored in this "Cloud", which would finally realize the construction and sharing of resources and avoid the repeating construction of resources. In addition, what deserves to be mentioned is that the CC and IOT environment could also help to improve the usage efficiency of education resources and also the quality of education. In our country, the local colleges have already been trying to use the "CCAI" and "CCBE" to build the individual education and information environment and support teachers' effective teaching and students' initiative studying, which would finally

help to improve the education quality of colleges and foster innovative and creative talents.

C. The integration of CC and IOT education resources

Nowadays, under the condition of information, the educational resources integration in military academies refers to the optimal allocation and full use of the various resources which was input to the military academy education, including the distributed entity educational resources of military academy education, and the distributed heterogeneous information education resources, through a variety of ways and means, especially the modern information technology, to help play the best efficiency. Therefore, the integration is a kind of special management activities to optimize the allocation of education resources and make full use of them. It is a kind of ideas to organize and manage education resources, a process to optimize and reconstruct the education resources system, and also one kind of environments of educational resources' effective use. The outstanding characteristics of overall perception, reliable transmission, intelligent processing under the CC and IOT environment may help to realize the intelligence of all kinds of educational resources inside and effectively improve the efficiency of management and resource use.

4. The Military Academy Education Resource Integration Mode in the "Cloud" and "Things" Environment

Although the IOT and CC is not really mature, many military experts still refer to it as "an undiscovered gold". Also the two engine powers, the "cloud" and "things", are destined to lead to the revolution of the informationization war. Here, we can try to structure "an integration system of educational resources in military academies" under the CC and IOT environment:

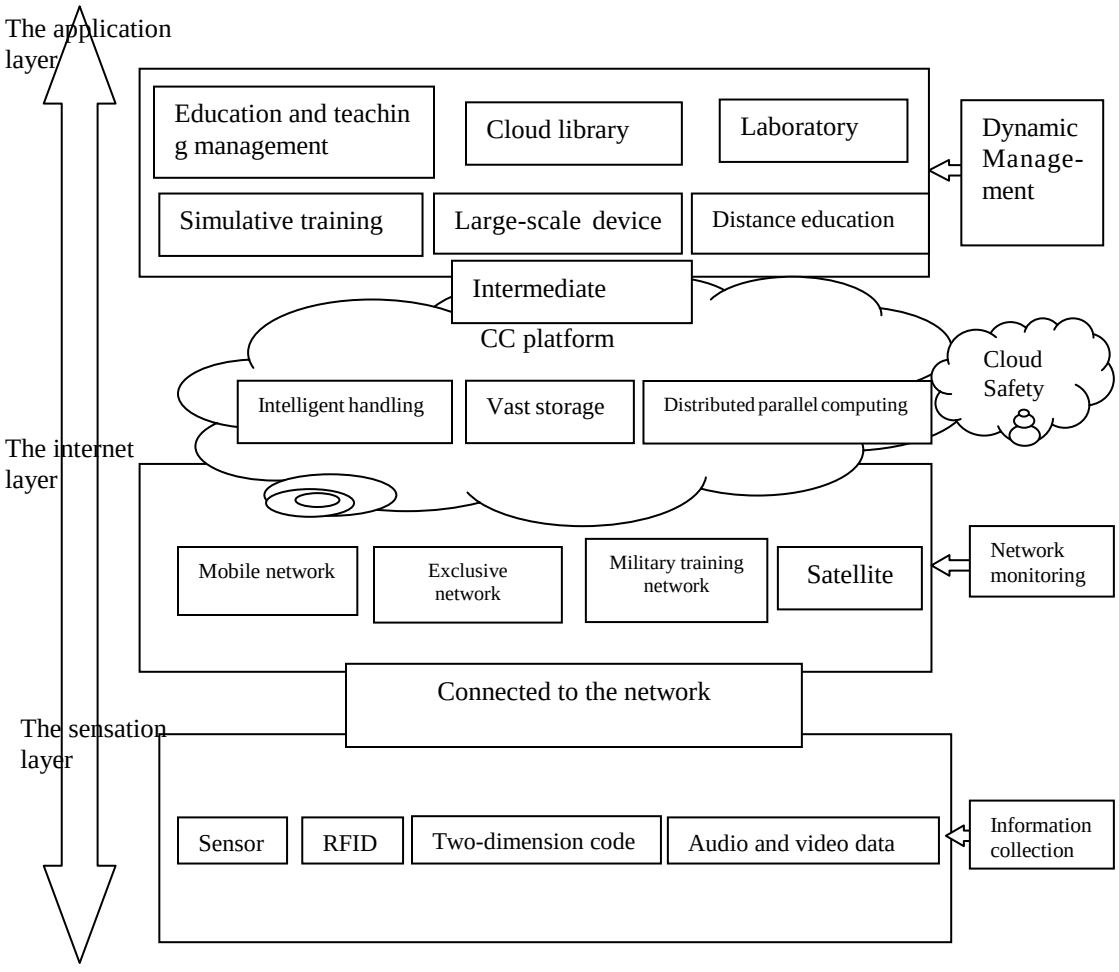

Fig. 1 Integration system of educational resources in military academies under the CC and IOT environment

According to the process of the IOT's perception, transmission and processing for information, the system can be divided into three layers, namely, the perception layer, the network layer and the application layer:

The perceptual layer: mainly used for acquisition and perception of various physical quantities, identification, audio data and video data in the physical world. Data acquisition is mainly related to sensors, RFID and two-dimensional code technology.

The network layer: mainly used to achieve greater, faster Network Interconnection, thus the perceived data information could be transported reliably and safely. The communication networks which can be used for the IOT mainly consist of military training network, wireless communication network, satellite communications network or other updated dedicated network.

The application layer: mainly includes the application supporting platform layer and application services layer. The application supporting platform layer is mainly used to support the information collaboration, sharing and interoperability among the cross industries, the cross application, and the cross systems, while we can also build the CC platform as the support.

5. The CC and IOT Environment of Military Academy Education Resources Integration Problems

As a new concept, there has not been a uniform standard and realization way for Cloud Computing and the Internet of Things. On how to achieve the integration of education resources under the "cloud" and "objects" environment, there are still some difficulties and problems to be solved.

A. Integration awareness under the CC and IOT environment

For new thing such as the "Cloud Computing" and the "Internet of Things", people a process to accept. Accompanied by the reform and innovation, breakthrough sand the liberation of thought cannot go further without no breakthrough concepts and ideological emancipation. Colleges are accustomed to use perceptible soft hardware facilities and scientific research experiment platform during resource integration. When researchers turn to Cloud Computing services, they may not be aware of on which server their data is placed, so is the position of this server. This kind of imperceptible feeling leads to worries like scientific experimental data and personal information leakage risk. And they would reject to make use of Cloud Computing and Internet service. These will all affect the wide dissemination and full application of Cloud Computing and networking services in the education resources construction of military academies.

B. "safe landing" of CC and IOT integration

Although CC and IOT can solve the problem of highcostin the infrastructure construction and investment related main tenance process during resource integration, the security problem itself is still not entirely reassured. The S3 storage service of Amazon once went offline for 8 hours because of a failure, resulting in the panic of masses of users[7]. If the data are all stored in the "cloud", which users themselves cannot control at all, once the confidential data is stolen by other users or destroyed by the virus, the influence could be extremely bad for military education resources which have a higher requirement of confidentiality. This will also become a vital factor in the widely application of CC and IOT. As in the technology of the Internet of things, real resources are connected to the virtual network, which enables users to obtain the information of goods directly without the intermediate links--"people". Thus users are able to realize the remote operation, monitoring and control of an object. Of course, there would also be consequences that are not most likely to be controlled by resource managers correspondingly.

C. Specialty in the field of military that need to be paid attention to

In addition to the security of CC and IOT environment that must be guaranteed, the specialty of military applications should also be considered. There is a higher requirement for building cloud services and the network infrastructure, and the access to the CC and IOT environment and the using process must be strictly audited. Because of a series of special requirement, the investment on those security infrastructures in the previous period cost may be too high, so is the technical requirement. In that case, the primary advantages of CC and IOT environment would be impacted. Thus these problems must be solved before the construction of CC and IOT environment, otherwise we will miss to achieve the original goal of the integration of resources—to maximize the efficiency of resources.

Although the widely and deeply application of Cloud Computing and the Internet of things in the field of education and teaching still faces various problems and challenges, it is undeniable that CC and IOT will contribute greater strength to the education resources integration as a powerful means with its low cost, high benefit, and unlimited development prospect superiority. At the same time, CC and IOT environment has brought great opportunities to the realization of military education informationization. This new integrated environment will also lead to significant changes in the construction of educational resources, teaching methods, and trigger in the update of the concept of military education technology. All the military education workers should explore the application mode of CC and IOT in education informationization actively, in order to improve the teaching quality of military academy education and play a greater role in the training of new military talents.

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