Thoughts about the Introduction of the Internet of Things into the University Laboratories

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Abstract

This paper proposes the idea of introducing the IOT technology and application into the university experimental system based on the status of rapidly growing popularity of the IOT technology in the context of the current information technology, then puts forward basic idea, methods as well as effectiveness of IOT introduction into the university experiment system with the example of the "Intelligent Logistics" experiment.

Keywords: Internet of Things (IOT), University Laboratories, Smart Logistic

1. Introduction

The Internet of Things (IOT) technology with its application is one of the main targets for current development of information technology in our country. It has been attracted a great concern of whole society in China after the Premier Wen Jiabao put forward the slogan "Sensing China" after his inspection of the Internet of Things Industry Research Institute of the Chinese Academy of Sciences, Wuxi in August 2009. In November 2009, Premier Wen put the Internet of Things included in one of the five elements of the national development strategic emerging industries once again in his important speech to the capital scientific and tech- nological circles "Let the Science and Technology to lead China's Sustainable Development" and wrote it into the government work report [1]. The "Twelfth Five-Year" development planning of IOT was promulgated in November 2011, and the IOT was again mentioned as a strategic emerging industries in the government work report of NPC and CPPCC in 2012 [2].

2. Necessity and Feasibility

The Internet of Things will come into people's lives with a rapid growing momentum, and will arouse unprecedented impacts in various fields of social development. It has been considered as an essential part of current information education in universities for students' understanding and grasping the IOT technology, also for their experience of the IOT application odds, their participation in the IOT operation practices and their full realization and understanding of the IOT technology [3]. It is very important for universities to show and implant the IOT technology fully with its application to the students opportunely for the aim to instill the concept of the IOT and to cultivate the talents who are fit to current IT development. So it is an important issue for the higher education training in universities to lead the IOT technology to the

process of model innovation of personal training.

More than 37 colleges and universities in China had established the IOT specialty by the end of 2011. The courses system with theories and practice teaching platforms were included for the building of framework and guarantee mechanism for the IOT talent training [4].

The target of professional training of IOT is mainly to make the students learn to master the technology of information-processing, the IOT system designing, developing and applying. The students to be trained are concerned essentially with those who have the learning experience of science and technology and the experimental and practical aspects of the specialty training is mainly based on science and technology too, such as the network and wireless communication technology experiments, the software development and application experiments, the configuration of electronic elements experiments and so on [5]. However, the application of IOT should not be limited only in those fields as mentioned above in reference to its popularity and application diamonds. It is now developing an enormous function in the realm of economic and management, business and trade too. The popularity of IOT technology application currently consists of a variety realm of intelligent application and management, which are including transportation, electricity, home, logistics, etc.

3. Feasible Experiment Projects

Students should have a basic understanding of the IOT technology and an obvious method to take part in the experiments from their diamond of major study. The running characteristics of the university should also be fully considered. For example, in the college of business, The IOT experiments should be arranged avoiding the highly demand of science and technology knowledge and skill such as Computer-Programming, Operation System Applications, Instrument Installing etc. and the "perception" and "experiential" projects about the IOT are believed more fit for them.

Based on the academic understanding of three-layer architecture of the Internet of Things: Perception Layer, Network Layer, and Application Layer [6], we could consider choose some appropriate experiments for students to perceive and operate in the three-layer architecture framework of the IOT.

The experiments based on the Perception Layer of the IOT are concerned essentially with the implements of Intelli-Sense and Certification technology of the IOT which mainly involve the EPC (Electronic Product Code), GPS, RFID, Scanning and Verification in Commercial Two-dimensional Code, Electronic Goods Label Certification [7] and other technologies. The experiments based on the Network Layer of the IOT are concerned essentially with the applications of Wireless Communication Technology and the Mastering of the Network Protocols. The experiments based on the Application Layer of the IOT are concerned essentially with the implements of the Network-Access and the Intelligent Processing technology, etc.

Here we can take the "Smart Logistics" experiment as an example to describe the use of the IOT technology and the procedure of setting the contents and scenes.
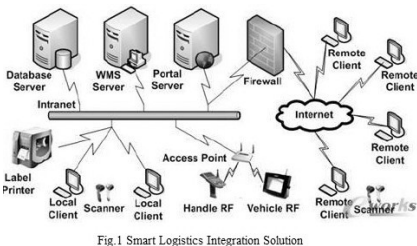

Fig.1 Smart Logistics Integration Solution

Fig.1 "Smart Logistics Integration Solution" notes the architecture diagram of the Smart Logistics experimental system. The IOT application of Smart Logistics mainly involves more technologies such as RFID, GPS, Mobile Communication and M2M, and in addition deals with Date Base, Data Query and Processing, Mobile-Commerce, Information Security Management and other aspects of information processing technologies.

The contents of the experiment system mainly involves the Date Acquisition, Date Management, Visual Processing and the Application System Integration, Above all, The system would be mainly focused on the following aspects.

(1) Functional Simulation experiments, which mainly involve in the Smart Logistics technology including Transportation, Out-of-Storage, Processing and Sorting of the Raw Materials and the Finished Products.

(2) Product Labeling Simulations. The manufacturer receives the EPC IS goods orders (electronic orders), then the factory (which is be simulated) completes production of goods affixing with EPC electronic tags directly after being packaged.

(3) The Management Simulations of Checking and Inquiring Products Based on the RFID Technology, which aim to realize the Intelligent Warehousing Management of Products in normal and abnormal, Out-of-Storage and the Fast Automatic-Inventory of Stock.

The experiments described above can be set and adjusted according to the specialized characteristics of the students and the teaching requirements of the universities to help the students apply their perceptual power to understand fully the Integrated Information Operations and Management with logistics technologies [8].

4. Safeguard Mechanism

The Internet of Things is a kind of new technology and the idea of introducing its applications to the University Labs is considered as an innovative and challenging idea. The combination of the IOT experiments with the university expertise needs to be carried out according to the requirements of the IOT applications and of the professional personnel training, and also needs for a reasonable configuration to the experimental resources and the teaching content.

Universities should provide wonderful experimental sites and equipments to conform to a certain standards in the course of configuring hardware resources of the IOT experiment system based on the basic requirements of the IOT environment.

5. Conclusion

It needs more efforts for universities to build the IOT experimental system to meet the requirement of their experimental teachings work which includes setting courses, building experimental platforms and background management system, improving student-assessment mechanism, as well as configuring the experimental teaching staffs. It also needs to think and solve many other problems for universities in the course of teaching operation such as the way to enhance the authenticity of the experimental perception, to guarantee the reliability of the experimental tools, to display the experimental process visually [9] and so on. It needs to consider for universities the difference of the students' gasping level to the IOT knowledge and the typical projects selection of the IOT experiments. Each problem mentioned above is awaited being explored and settled continually in the course of introducing the IOT into the university laboratories.

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