

Research Article

Implementation of an RFID Medical Center Allocation and Picking up Process Support Cloud System

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Abstract: In this study, the expendable medical supplies warehouse of the Medical Center can be seen as a logistics center. The users act as the front-end clients and the medical material is a cargo. The concept combines RFID, PDA technology and cloud computing to design and implement the system. The main purpose of the system is to reduce the errors when the operating personnel distribute the expendable medical supplies.

Keywords: Cloud computing, database, diagnosis relations group, hospital global budget, RFID

INTRODUCTION

In Taiwan, implementing the health insurance of the whole people, the medical institutes increase income really difficult, because of the standard payment, total value in limiting to the quota type, paying some values floating pressure, Tw-DRG and facing medical competition of market, etc., Gavin *et al.* (2003a), (2003b). In order to reduce the cost of hospital, the control of the hospital goods, materials and equipment becomes a quite important job. (Agusti *et al.*, 2007).

The main purpose of the system is to reduce the errors when the operating personnel distribute the expendable medical supplies (Yang and Tentzeris, 2007; Dzikx, 2006). Because of the wide varieties of materials, procedures in the distribution of the number or projects are prone to error (Brian *et al.*, 2003). It takes more time and mental to remedy mistakes and even produce bad debts and delays the processes (Huang, 1998).

Cloud Computing is a technology that uses the internet and central remote servers to maintain data and applications. Cloud computing allows consumers and businesses to use applications without installation and access their personal files at any computer with internet access (Zhen *et al.*, 2011). This technology allows for much more efficient computing by centralizing storage, memory, processing and bandwidth. Radio-Frequency Identification (RFID) is the use of a wireless non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag

attached to an object, for the purposes of automatic identification and tracking.

In order to solve the above-mentioned problems, we use RFID and the character of cloud computing to design a data processing platform. Users can fast access information through the Web Service (Barroso *et al.*, 2003).

Objectives: In this research, we use PDA, Cloud Computing and RFID technology to implement this system. The main purpose is to reduce the mistake produced by personal because the kinds and number of the goods, materials and equipment are complexity.

We use Hadoop to be the cloud computing platform of this system. Hadoop (2011) Apache Hadoop is an open source software framework that supports data-intensive distributed applications licensed under the Apache v2 license. It enables applications to work with thousands of computational independent computers and petabytes of data. The Fig. 1 is a multi-node Hadoop cluster.

A Personal Digital Assistant (PDA), also known as a palmtop computer, or personal data assistant, is a mobile device that functions as a personal information manager. PDAs are largely considered obsolete with the widespread adoption of smart phones.

Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. In

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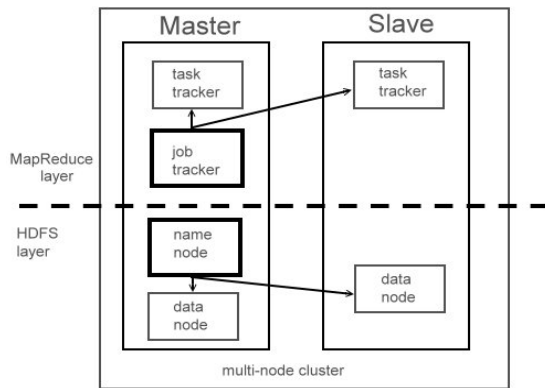


Fig. 1: Multi-node Hadoop cluster

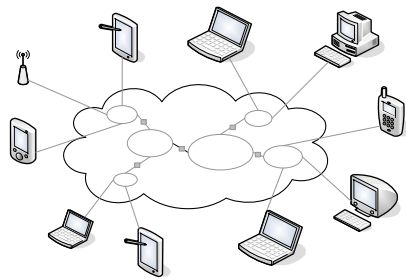


Fig. 2: The diagram of the cloud computing

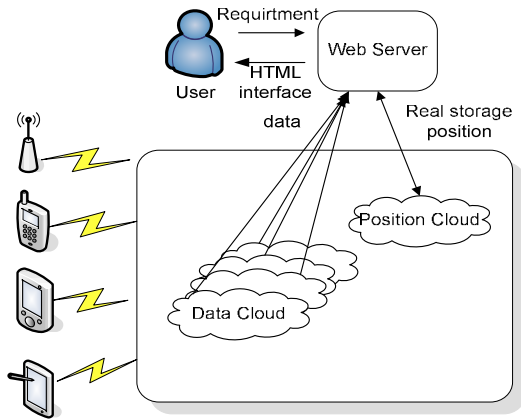


Fig. 3: The system structure

the flow diagram of the computer network often use a cloud pattern as Fig. 2 (Schaffer *et al.*, 2009). Radio-Frequency Identification (RFID) is the use of a wireless non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking.

The structure of the system is as Fig. 3. We use the web server for the requirement and Html interface. The

real position of goods, materials and equipment are storage in the position cloud and data analysis is in the data cloud.

Web server can refer to either the hardware (the computer) or the software (the computer application) that helps to deliver Web content that can be accessed through the Internet (Mockus *et al.*, 2003).

The most common use of web servers is to host websites, but there are other uses such as gaming, data storage or running enterprise applications.

There are five main functions in the “RFID in Allocation and Picking up Process Support cloud System” (Fuhrer *et al.*, 2006):

- **Connect to the database and data format conversion:** The existing units of medical material please apply for a single data format conversion, is for PDA data import.
- **Information for safe handling:** The system settings assigned to all system users to a group of accounts and passwords.
- **Storage group data exchange between your computer and PDA:** Use wireless transmission and storage of the PDA group of computers to synchronize data exchange. The feature units of demand form, into the PDA and enable different PDA to deposit in different units of medical material requirements.
- **Provide electronic label read and write functions:** Each tag has its number of labels and is unique and cannot be changed. This system sets up this space for storage between the product code and product name.
- **PDA picking reminded:** When the amount of medical materials complement is not complete, the system will call fill in black font displays the current status. Complement of medical material is complete and the system displays in grey font for already fill complete.

SYSTEM DISPLAY AND ANALYSIS PROCESS

Firstly, we use PDA to enter account number and password, in their capacity as identification Fig. 4. After entering the main screen, we can select four different job functions Fig. 5.

After we go to the synchronous screen, the PDA links custody group of computers through wireless transmission technology for data exchange operations Fig. 6. In Fig. 7 we enter the volume label after the read and write images which can store different characteristics of medical material information and facilitate the provision of personnel reference. The



Fig. 4: Login screen



Fig. 7: Tag read/write



Fig. 5: Main screen



Fig. 8: Picking operation



Fig. 6: Database synchronization



Fig. 9: Change password

Fig. 8, after we entering the picking images may be for picking and picking scenario prompted the current. Finally, entering the change password screen, we can be done in accordance with the user demand change in Fig. 9.

CONCLUSION

Because the technology of RFID and related hardware are improvement, some cases which use RFID technology to improve the medical care

environment. The "RFID allocation and Picking up process support cloud system" uses RFID and PDA to replace Bar-Code, because the RFID technology more than the Bar-Code to read fast and accurate information. When RFID combines with PDA and database, it can reduce most of the human operation errors and more convenience.

As RFID is still emerging technology in the domestic industry, the current RFID technology specifications have not yet unified and without energy production, the costs than existing technologies (such as: Bar-Code) to the much higher, making the hospitals into the science and technology will neither high. Look forward to improving the hardware and software, IT personnel's ability to be more mature, the actual functions of the system can be used in medical institutions and demonstrate its value.

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REFERENCES

- Agusti, S., J. Domingo-Ferrer, A. Martínez-Ballesté and V. Daza, 2007. A distributed architecture for scalable private RFID tag identification. *Comp. Networks*, 51(9): 2268-2279.
- Barroso, L.A., J. Dean and U. Holzle, 2003. Web search for a planet: The Google cluster architecture. *IEEE Comp. Soc.*, 23(2): 22-28.
- Brian, S., E. Chad, H. George, S. Sanjay and B. Michael, 2003. Measuring the Impact of Information Technology on Value and Productivity using a Process-Based Approach: The Case for RFID Technologies. MIT Sloan Working Paper No. 4450-03/ CCS Working Paper No. 223.
- Dzik, S., 2006. RFID and Smart Packaging in Healthcare. Retrieved from <http://www.idtechex.com/smarthealthcareusa/3.as>, (Accessed on: March 25, 2006).
- Fuhrer, P., D. Guinard and O. Liechti, 2006. RFID: From concepts to concrete implementation. Proceedings of the International Conference on Advances in the Internet, Processing, Systems and Interdisciplinary Research (IPSI), Marbella, Belgrade, Serbia and Montenegro.
- Gavin, C., D. David, G. Greg, G. Lyle, S. Jeff and T. Joseph, 2003a. Auto-ID in the Box: The Value of Auto-ID Technology in Retail Stores.
- Gavin, C., Lyle, G., Paul, S., Jeffrey, S., Joseph, T. 2003b. Auto-ID on Demand: The Value of Auto-ID Technology in Consumer Packaged Goods Demand Planning.
- Hadoop, A., 2011. Retrieved from: <http://hadoop.apache.org/>, (Accessed on: June, 2011).
- Huang, F.H., 1998. Hospital material management in Taiwan: A survey. *Hospital Mater. Manag. Quart.*, 19(4): 71-81.
- Mockus, A., R.T. Fielding and J. Herbsleb, 2003. Two case studies of open source software development: Apache and mozilla. *ACM Trans. Software Eng. Methodol.*, 11(3): 309-346.
- Schaffer, H.E., S.F. Averitt, M.I. Hoit, A. Peeler, E.D. Sills and M.A. Vouk, 2009. NCSU's virtual computing lab: A cloud computing solution. *IEEE Comp. Soc.*, 42(7): 94-97.
- Yang, L. and M.M. Tentzeris, 2007. Design and characterization of novel paper-based inkjet-printed RFID and microwave structures for telecommunication and sensing applications. *IEEE MTT-S Int. Microw. Symp. Dig.*, pp: 1633-1636.
- Zhen, J.L., C. Cheng and W. Kai, 2011. Cloud computing for agent-based urban transportation systems. *IEEE Intell. Syst.*, 26(1): 73-79.