ICISLM: Design of an Integrated Cloud Information System for Logistic Management Based on Web Server Virtualization

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Abstract. This research aims to design an integrated cloud information system for logistic management (ICISLM) based on web server virtualization and Software as a Service (SaaS) architecture. Based on web server virtualization technology, ICISLM provides rentable and scalable environments for enterprises, enabling enterprise customers to operate the system without the need to install any software or manage the cloud servers. The aim of ICISLM is to provide a single system that can satisfy warehouse management, logistics monitoring, and downstream customer needs. A workflow dispatch mechanism was designed to dynamically dispatch the services host and to stabilize system operation. A case study is provided to verify the function of logistics service pools.

Keywords: web server virtualization, cloud computing, SaaS, RFID, ICISLM.

1 Introduction

The rapid development of large-scale server hosts and improvements in their processing capacity in recent years have allowed the replacement of a large number of individual computers. Properly utilized, virtualization technology can be applied to improve the performance of large-scale servers. The pervasiveness of Web 2.0 and Wi-Fi networks has also quickened facilitated service integration and resource sharing around the world. In previous study, Chen et al. proposed a SaaS model for implementing cloud-based logistic systems, which enabled enterprises to develop its own logistic systems in both private and public cloud infrastructures [1]. Based on the their research, this study aimed to provide logistics enterprises with an integrated cloud information system for logistics management by utilizing SaaS architecture as

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the cloud service provider with virtual server technology. The system deployed in this study uses virtualization technology to build a single server host with multiple virtual web server environments. This reduces the cost of hardware deployment and improves operational efficiency.

1.1 Application in Cloud Computing for Logistic Information Systems

The NIST (National Institute of Standards and Technology) indicates that a cloud computing system must include five basic characteristics: (1) On-demand self-service, (2) broad network access, (3) resource pooling, (4) rapid elasticity, and (5) Measured Service [2]. We discuss the present cloud service company to include VMWare [3], Chunghwa Telecom Hicloud (CAAS) [4] and Microsoft MCloud (OACloud cloud Office) [5] and a method by which to achieve the five basic characteristics suggested by the NIST. We have found that many cloud service companies are providing similar services, but few provide for logistics management. Bernhard Holtkamp, etc. analyzed the three service models defined by the NIST for the cloud logistics management system [6], and they suggested that the system should consider more than one warehouse worker to share a server, for example, implementing a user identity mechanism to avoid termination of the application. Shang-Liang Chen etc. proposed a model based on SaaS cloud computing architecture for the RFID logistics management system [7]. They adopted dual-mode RFID to develop logistics and inventory systems and used service-oriented architecture to enhance system flexibility [8]. However, according to the SaaS maturity model levels proposed by the Microsoft MSDN Architecture Center [9], we established that the above research only matched the SaaS maturity model to level-2. Thus, it is the goal of the current work to develop a rentable cloud system for logistics management and to improve the architecture in order to satisfy the SaaS maturity model to level-4. According to the definition from Forrester's SaaS Maturity Model level 4 [10]: At level 4, an advanced SaaS vendor provides not only a well-defined business application but also a platform for additional business logic. This complements the original single application of the previous level with third-party packaged SaaS solutions and even custom extensions. The model even satisfies the requirements of large enterprises, which can migrate a complete business domain like "customer care" toward SaaS.

1.2 Application of Virtual Web Server Technology

Microsoft has pointed out that most servers have an average utilization rate of only 10-15%. Hence, virtualizing the server can save more than 60 percent of the hardware costs [11]. A comparison of the virtual and physical web server architecture [12] [13] is provided in Table 1: