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Research and Application of Migrating Legacy Systems to The Private Cloud Platform with CloudStack

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***Abstract* - Legacy systems is a difficult problem to deal with, the outdated technology makes it difficult to do directly modify to codes, aging hardware environment make the system slow to respond, but they become more and more indelible because of the deep bundle dependencies. Although this is a time-consuming and difficult task, but the renewing of legacy systems have to be seriously faced because of its importance to enterprise. The concept of cloud computing has been proposed to build a private cloud-based information systems management model into an efficient, cost-effective solutions, virtualization technology has been used a lot, and it provides a new direction for the migration of legacy systems. In this paper, wo decomposition analysis of the legacy systems, combine legacy system migration solutions and virtualization technology with the application of cloudstack which is an open source cloud platform owned by Citrix Systems, using SOA and web services technology on the part of the system functions to do the reconstruction, we build an enterprise private cloud platform.**

Index Terms* - *Legacy Information System(LIS); Private cloud platform; virtualization; cloudstack; system migration.

I. INTRODUCTION

Legacy information systems are typically the backbone of an organization's information flow and the main vehicle for consolidating business information [1], they are written at different times using different development platforms, different data structures, different implementations. Over long time, their hardware systems are not well co-ordination with the changing working environment. Legacy systems can cause host organizations several problems such as: technical obsolescence, slow system response, aging hardware, low stability and maintainability. But at the same time their importance is undeniable. They are indispensable, and even most of them can't stop running. In essence, it is a business-critical system which has an architecture that makes it difficult to evolve to address new requirements [2, 3]. How to deal with these legacy systems? Almost every software engineer must face the problem, which has become the world's a common issue today

The continuous development of the Internet has profoundly changed the way we work, study and live. New needs of business and computer network technology advances so that the cloud computing came into being and started toward the front of the field of IT, also began imperceptibly to change the way we use software. The U.S. National Institute of Standards and Technology (NIST) defines Cloud computing: 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. This cloud model promotes availability and is composed of five essential characteristics (On-demand self-service, Broad network access, Resource pooling, Rapid elasticity, Measured Service); three service models (Cloud Software as a Service (SaaS), Cloud Platform as a Service (PaaS), Cloud Infrastructure as a Service (IaaS)); and, four deployment models (Private cloud, Community cloud, Public cloud, Hybrid cloud)

The core concept of cloud Computing is calculated and stored as public facilities available to network users. To provide users with the same features found in commercial public clouds, private/hybrid cloud software must [4]

1) Provide a uniform and homogeneous view of virtualized resources, regardless of the underlying virtualization platform (such as Xen, Kernel-based Virtual Machine (KVM),or VMware).

2) Manage a VM's full life cycle, including setting up networks dynamically for groups of VMs and managing their storage requirements, such as VM disk image deployment or on-the-fly software environment creation.

3) Support configurable resource allocation policies to meet the organization's specific goals (high availability, server consolidation to minimize power usage, and so on).

4) Adapt to an organization's changing resource needs, including peaks in which local resources are insufficient, and changing resources, including addition or failure of physical resources.

II. BACKGROUND

Huai'an City is located downstream of the Huaihe River Basin, the specific geographic and climatic conditions, Huai'an is a "flood corridor", the Prevention of floods and drought is very hard to do well. Huai'an City Flood Control and Drought Prevention Headquarters (HCDH) put great importance to the application of advanced information technology in flood and

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drought prevention work, and gradually configured a number of hardware resources, building a series of flood and drought applications are: Huai'an City Geographic
Information System Huai'an integrated query system of water and rainfall, Huai'an City flood control system, the Huaihe River Basin flood Forecasting System, and medium-sized reservoir flood forecasting and dispatching systems, etc. these systems are deployed on many multiple servers, the status of the application of information technology can use the figure 1 shows.

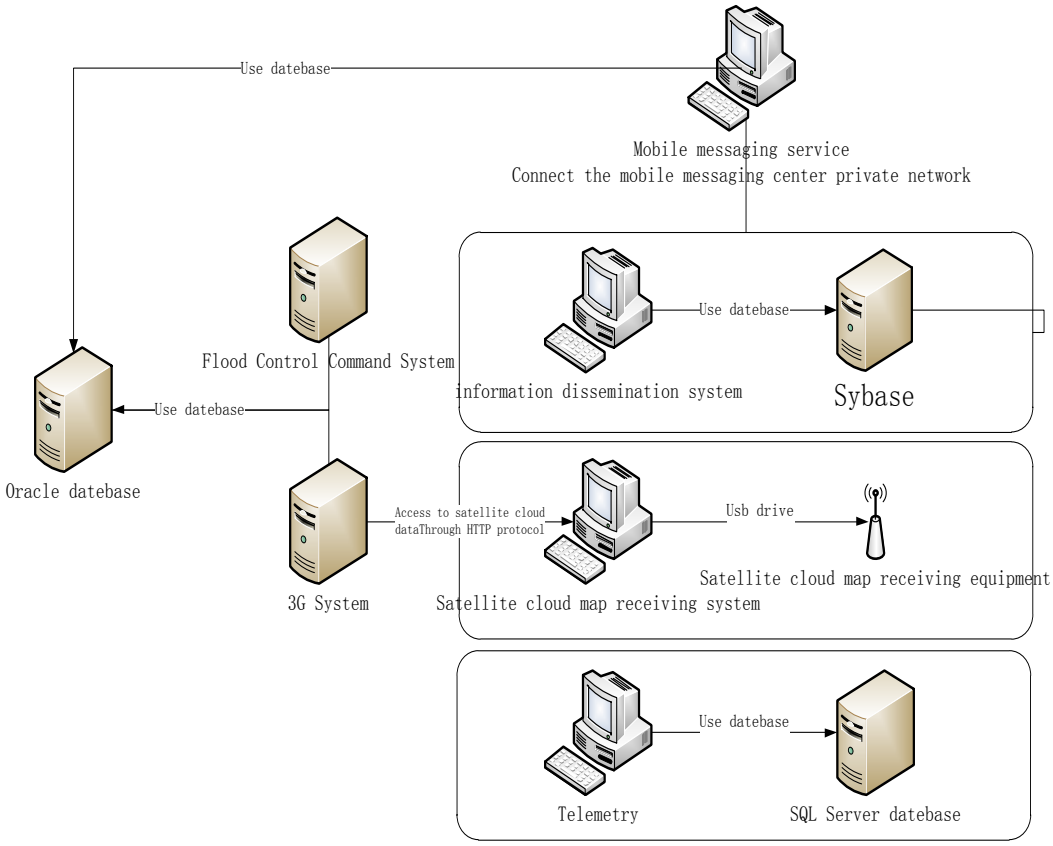

Fig1. Topology map of Huai'an legacy system

Most of these systems are unable to access or be managed through the network, only relevant staff can access and use the system on the local machine, data from disparate systems can't be comprehensive utilization. In addition, with the requirements of the development,. It requires different user-levels to manage the more and more users accessing these systems, the existing system architecture organization can't meet the need.

III. PROBLEMS ANALYSIS

Over years the existing application system for flood and drought prevention work has played an important role, due to the various subsystems are deployed in a single desktop PC or server, users can not to access these systems and relevant data in a uniform way, which resulted in the following problems:

1) Systems and data security is not guaranteed.

2) Subsystem of flood and drought information platform hosted and distributed deployment on multiple servers, the application of the system difficult to unified management and maintenance.

3) Resource utilization is low. Each information system exclusive server, and the information system itself tend to be lower server utilization, server CPU utilization is always between 5% -20%, it don't belong to resource-intensive applications. Software and hardware resources are dispersed, the utilization is not high. A lot of computing resources are wasted, thus resulting in a lot of power waste.

4) User's access is not convenient, and the load capacity of a single system can't meet the increasing service access requests.

5) The system hardware has a certain number of ages, with time pass by, the reliability and availability of PC machine or server hardware get down.

The description of the problem above show the existing information integration platform is difficult to meet the new requirements of the flood and drought prevention tasks in the new time.so they belong to the legacy information systems.

IV. SOLUTION

Several solutions have been proposed to these LIS problems. These solutions fall generally into three categories: redevelopment, which rewrites existing applications; wrapping, which provides a new interface to a component, making it more easily accessible by other software components; and migration, which moves the LIS to a more flexible environment, while retaining the original system's data and functionality.[1] Due to the complex diversity of flood and drought information platform, the developer's liquidity and historical documents missing, it's difficult to organize a term to carry out redevelopment or wrapping. Although equipped with new high-performance machine, directly clone of the flood and drought information platform is difficult. There are two reasons

1) Due to the pass of time, the original system installer configuration file is difficult to back up, and they can't be migrated directly to the high-performance machines easily.

2) The original system need to deploy the operating system environment. Because the version is too low, it's difficult to efficient use the resources of new high-performance machine

At this point, it's necessary consider the problem: protect the system security; improve the compatibility of the application system; accelerate applications; service availability; resource utilization; dynamic for a particular application deployment of resources; reducing energy consumption. Therefore, the study of how cloud-based computing concepts and techniques to build and develop new flood and drought information integration platform has both theoretical value and also has great practical significance.

V. BUILD PRIVATE CLOUD PLATFORM

A. CloudStack

CloudStack is an open source cloud compute platform used to deliver Infrastructure-as-a-Service [6]. As an open source virtualization management platform written by java . CloudStack has high availability, scalability and good at management for large-scale virtual machine cluster . CloudStack supports most popular virtualization platform, such as VMware, Oracle VM, KVM, Xen Server and Xen cloud platform. CloudStack provides three ways for cloud computing environment management: through web, command line mode and API mode based on REST. Compared with the rest of the virtualization platform management software [8], this paper adopts cloudstack to do legacy system migration.

B. Structural Design

The overall framework of the private cloud platform as shown in figure 2 is a Multi-tier architecture composed of the physical layer, infrastructure layer, service layer , presentation layer, client layer and platform interfaces with the mobile operators.

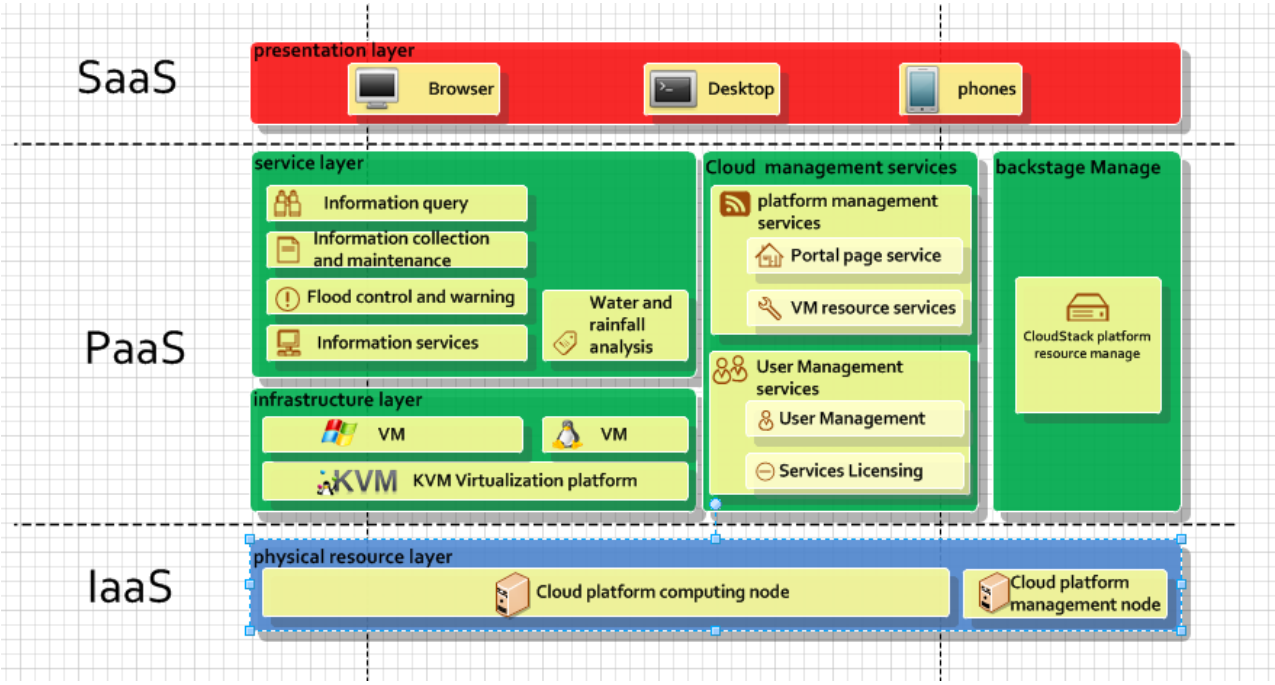

Fig 2. Overall framework map of flood and drought of cloud platform

The bottom is the physical resource layer. Physical resources layer provides the physical resources of the entire platform, including a variety of server, PC machine, computer and switches and other network facilities, which provides the physical carrier of the cloud computing platform. In accordance with their different roles in the platform, the server is divided into two types of nodes: management node of the cloud platforms and cloud platforms compute nodes. The cloud platform management nodes deploy resource management services of cloud platform, cloud platform compute nodes provide the computing resources of the virtual machine.

Above the physical layer is infrastructure layer, CloudStack is Installed in the cloud platform computing nodes .The hardware resources can be divided into virtual machines by using KVM[7]. A variety of services can be deployed on a virtual machine and the use of P2V comply Legacy systems migration to virtual machine. Through the portal, each service is managed in a uniform manner and presentation. PC, laptop, tablet and smartphone users can access the services provided by the cloud platform.

On the service layer, service layer specific services cluster is provided.

Service cluster for different functions in the presentation layer, a variety of access methods are offered. Users can access legacy systems platforms by via Remote Desktop, In addition to the PC side, smart phones, tablet and other cloud-to-end access way are provides.

C. Legacy Systems Migration

We use vmware p2v technology (migration from the physical machine to virtual machine) to Deal with legacy systems, it can migrate the physical server's operating system, application software and data to the virtual servers managed by VMM (Virtual Machine Monitor) as shown in figure 3.

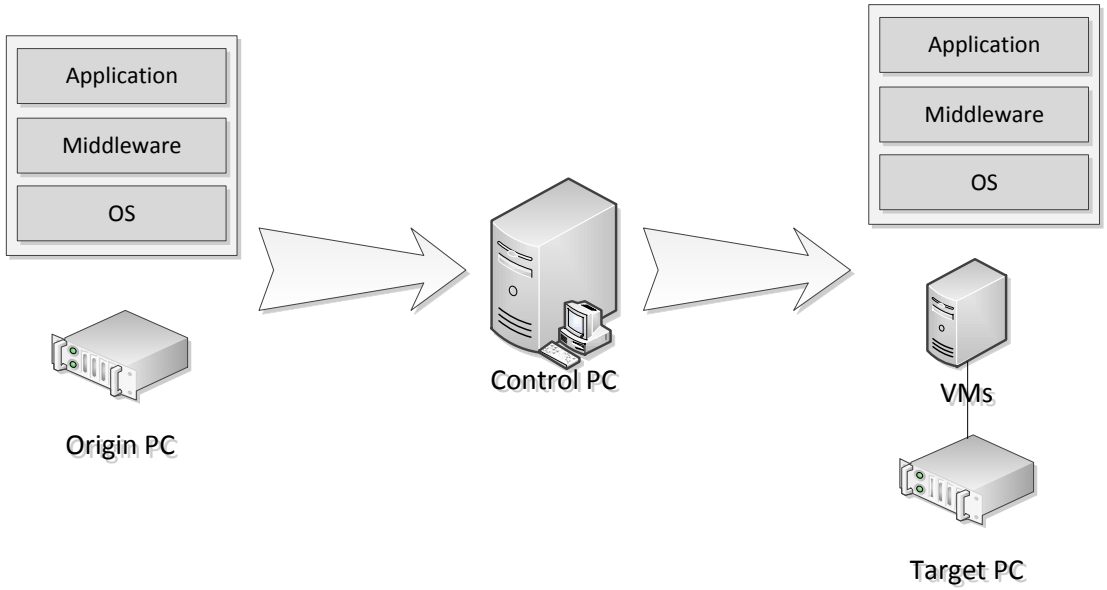

Fig 3. P2V

TABLE I. FLOOD AND DROUGHT INFORMATION RELEASE PLATFORM MIGRATION RECODE

	before	after
System deployment	Physical machine	VM
CPU	Pentium IV	Virtual CPU*2
Memory	900MB	2G
Hard disk	80GB	120GB
time	2h	
Summary	After migration, the system is deployed in a virtual machine. According to actual needs for the expansion of the system CPU, memory, hard drives and other resources. In actual use, the migrated system work well. System migration successful	

Reliability refers to the proportion which usually be measured as a percentage of the total time that the normal working of the system in a given period of time. Factors that affect system reliability in the traditional information are server exception shutdown, server attacks, operating system crashes, software crashes, power failures, network outages. We offer solution effectively improve the reliability to ensure that even if the hardware and software problems, the service is still available. Solution based on the rapid deployment of virtual machines. Solution is based on the rapid deployment of virtual machines. Cloud platform management services make the virtual mechanism for deployment of information systems as a virtual machine images. When information system problem occurs, the same virtual machine can be quickly generated by the virtual machine images, and take over down the information system to provide services to users. Rapid deployment time

control in a minute level to achieve rapid deployment based on virtual machine

D. System Integration

Scattered for multiple subsystems, user access is not convenient, this problem is not resolved during the migration, so we have to unification of the various subsystems. Specific programs to achieve single is sign on (SSO) and portal integration. Which make users to feel that the system is like a system. User can access all multiple systems only need to log in once. To do this, a simple transformation on each system must be done. They will be packaged as multiple services cluster for the private cloud platform which using a Re-developed unified user management system, unified authentication center, unified licensing mechanism

From a software engineering perspective, SOA includes a set of principles and methods for design, development and deployment of software systems, its biggest advantages is provide loose coupling mechanism and cross-platform features to the software. Web services are self-contained and self-characterization, so components based on standard can be accessed through the Web which is the main way to implement SOA. Typically, cloud services are designed to the standard Web services, and incorporated into the SOA system to be manage and use. Through decomposition, analysis of the various subsystems of the legacy systems, the platform can be divided into seven major service cluster shown in the figure 2, each service cluster contains a number of services, each service provide users with a variety of business functions by Specified interface.

VI. CONCLUSION

Cloud, virtualization is one of the general direction of IT development. In this article the legacy systems of HuaiAn City Flood Control and Drought Prevention Headquarters are expanded and updated effectively with the use of open source virtualization server management software cloudstack, utilization of the water systems in a variety of information resources and system stability are improved, the now private cloud platform can work well with the new environment which is changing all-time. With Virtualization technology, Migration of legacy systems became more convenient and efficient.

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