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A SaaS Development Platform Based on Cloud Computing

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Abstract

Using Java technology to research and develop a SaaS development and maintenance platform which is based on cloud computing, it includes many modules such as the cloud computing load network, application server, development framework, cloud computing development engine, operation and maintenance system and so on. the platform can provide a complete network client software development scheme for the development of software and integration, it can reduce the user's request to SaaS technology, and it can help the user to achieve operation service of product on the Internet. at the same time, the platform as a development tool can be used as a powerful supplement of core electronic devices, high-end general chip and basic software products.

Keywords*: Cloud Computing, SaaS, Middleware*

1. Introduction

Cloud computing is the ability to access a pool of computing resources owned and maintained by a third party via the Internet. It isn't a new technology but a new way of delivering computing resources based on long existing technologies such as server virtualization. the "cloud" is composed of hardware, storage, networks, interfaces, and services that provide the means through which users access the infrastructure, computing power, applications, and services on demand and independent of location. Cloud computing usually involves the transfer, storage, and processing of information on the provider's infrastructure, which is outside the customer's control [1-2].

Cloud computing has four big characteristics which are taking the network as the center, to provide service way, high extended high reliability, resource pooling ,transparent and so on, with the apprearing of cloud computing, it bring the IT resources with the operational conditions. Cloud computing includes three kinds of mode which are the IaaS (Infrastructure as a service, Infrastructure that is Service), PaaS (Platform as a Service Platform, namely services), SaaS (Software as a Service, Software that is Service), and the core technology of the modes involves has huge difference. The three levels of cloud computing have not inevitable relation on technically, but in the eyes of the technology develop trend and practical, the relationship of the three levels will be more and more closely.

The each part of the Cloud computing includes many programming language, operating system, database, Web server, agreement and application programming interface (API). The key is to identify which cloud service really suitable for their internal systems, applications and skills. Amazon's elastic calculation cloud, Google application engine and Windows Azure are three typical representatives.

Amazon's EC2 provides customers with a variety of software choice, such as Windows Server, OpenSolaris and seven Linux version, MySQL, SQL Server, and some development environment such as Oracle 11 g database, Java, JBoss, Ruby on Rails and so on [3, 7, 12].

The specialty of Google is easy to use for us. The application engine can help users to use Google's independent to develop database and other infrastructure software; and it can through the API to use caching, mirror, mail and other services. Python is the only programming language which is supported, but Google is also going to support other programming languages in the future.

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The Windows Azure and Azure service platform has a relation with the Microsoft's internal deployment of enterprise software series. The Azure includes SQL Server of trusteeship versionst, Dynamics CRM and net service, it is developed by using Visual Studio and the.net framework. The Microsoft says, Azure will support the open protocol (HTTP, REST, SOAP and XML) and the Microsoft programming language (Eclipse, Ruby, PHP and Python).

2. The Main Work

Cloud computing builds heavily on capabilities available through several core technologies and capabilities [4-6] :

(1) Web application and services. Software as a service (SaaS) and platform as a service (PaaS) are unthinkable without Web application and Web services technologies. SaaS offerings are typically implemented as Web applications, while PaaS offerings provide development and runtime environments for Web applications and services. For infrastructure as a service (IaaS) offerings, administrators typically implement associated services and APIs,such as the management access for customers,using Web application/service technologies.

(2) Virtualization IaaS offerings. These technologies have virtualization techniques at their very heart; because PaaS and SaaS services are usually built on top of a supporting IaaS infrastructure, the importance of virtualization also extends to these service models. In the future, we expect virtualization to develop from virtualized servers toward computational resources that can be used more readily for executing SaaS services.

(3) On-demand self-service. Users can order and manage services without human interaction with the service provider, using, for example, a Web portal and management interface.Provisioning and de-provisioning of services and associated resources occur automatically at the provider.

(4) Ubiquitous network access. Cloud services are accessed via the network (usually the Internet), using standard mechanisms and protocols.

(5) Resource pooling. Computing resources used to provide the cloud service are realized using a homogeneous infrastructure that's shared between all service users.

(6) Rapid elasticity. Resources can be scaled up and down rapid and elastically. resource/service usage is constantly metered, supporting optimization of resource usage,usage reporting to the customer, and pay-as-you-go business models.

The main task of our platform is using the Java technology to research and develop a platform which is based on the SaaS's development, operation and maintenance, it includes five modules which are cloud computing load network, cloud computing engine, application server and development framework, the service delivery platform, operation and maintenance system. The overall logical structure as shown in figure 1:

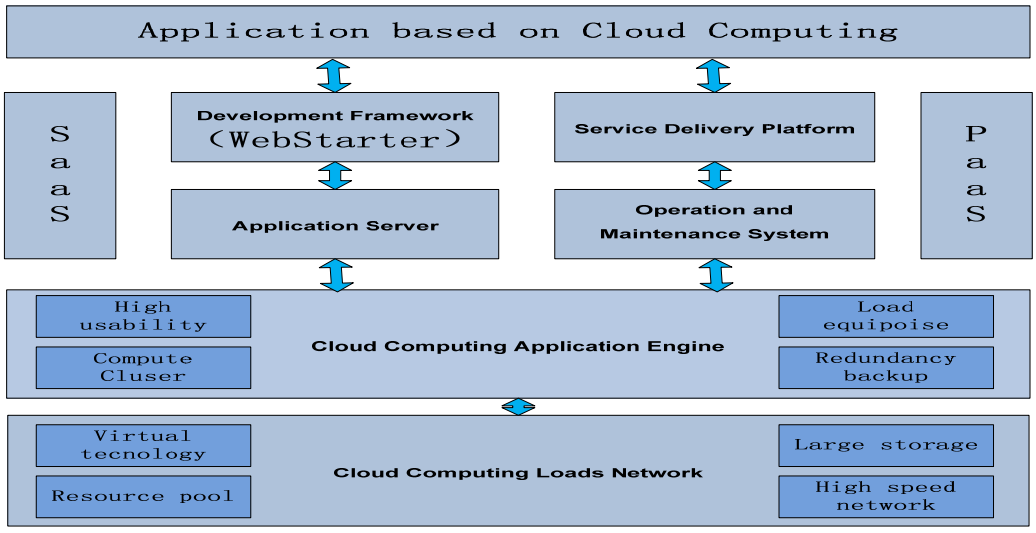

Figure 1. Framework of SaaS Development Platform based on Cloud Computing

2.1. Cloud Computing Loads Network

Cloud computing loads network is formed mainly by the cloud computing resource pool, infrastructure management server and application software. Cloud computing resource pool is formed by a group of CPU which can realize automatic supply and recovery of beforehand custom-built and memory resources, it concrete includes server node equipment and single storage devices. Because of many characteristics of the cloud platform, it needs a big resource pool to reflect, such as dynamic migration, load balance and high availability, so we use two servers and a disk array to constitute.

The infrastructure management server of the Cloud computing is a dedicated server, which basic function is to installation, operation and management of the entire cloud infrastructure toolkit.

The Cloud computing application software (basic package) is based on Web2.0,and it does the resources supply and recovery (such as Web server, Web application server, database server, directory services, etc.) according to the service request.

2.2. Cloud Computing Application Engine

The search engines is a deployment and operation platform which is built on the basis of the traditional operating system or the application of PaaS, it through the Internet to provide application development, testing, deployment and hosting services for the developers, and it through the way of platform service to delivery application infrastructure, the developers need not to care about the complicated technical architecture and details of deployment and implementation, it can develop cloud computing application which has characteristics of automatic enjoy load balance, elastic expansion, and disaster tolerance. application engine is mainly formed by the application hosting environment, cloud application middleware, many tenants database, the environment of application development and the environment of application test [8-11].

The application hosting environment is the core of the application of the engine components, it supports the deployment of the application, custody and operation, and it provides the monitoring of the application, the scheduling of the resource and isolate securely. The application which is deployed in hosting environment can share the resources of the PaaS platform, it can be divided into two kinds of hosting environment which are the shared hardware and the shared platform according to the sharing level of the resources. shared hosting server hardware environment is built based on the virtual machine and traditional application container, and each virtual machine only can deploy a application example, relying on the virtual machine to implement application of coarse particle size segregation, the application which is deployed in hosting environment only can share server and operating system, and each application needs to be independent application container, middleware and database, the traditional application without modification can direct deployment; sharing platform hosting environment is a kind of the fine particle size isolation technique extension application server, deployed in its application not only sharing platform hardware and operating system, application of sharing platform of containers, middleware and database, hosting environment through the sandbox technology application to realize fine granularity, isolation, and the application of use of the resources of the real-time monitoring and accurate measurement.

Cloud application middleware services provides business independent cloud applied basic function for the hosting cloud application, and compared to the traditional enterprise middleware, the cloud application middleware has many tenants, and it can provide services for multiple developers and multiple applications at the same time, providing the service interface that is based on Web can expand flexibly according to the applied load. cloud application middleware mainly includes cloud change process service, bus services and service strategy, which is used to support the application of driven, the application of event driven and the application of time period which are deployed on the application process of engine.

2.3. Application Server and Development Framework

The application server has application startup, deployment, online update functions and user online state management, it mainly realize the centralized management of the server resources. the application development environment is used for the development and deployment of the application of cloud computing application on the engine, it supports the development of the specific language of application of engine, it provide the class library,

components, applications, framework and debugging tools which are used to develop the cloud application, it can reduce the threshold of cloud application development. Development framework which is based on Java development tools to realize SaaS application development support, it includes interface development, application integration, distributed service access, debugging, deployment, and other functions, and it provides with the operation and maintenance system interactive ability, and to realize to control the user according to the function of the software. The main solution is according to the research and development of the Web project modular development and integrated framework WebStarter, it is based on OSGi, template technology development, support the topic, single page, menu configuration, user management can be replaced, and module hot plug, support for multiple page technology, and other features.

2.4. Service Delivery Platform

At present, the industry to business delivery platform is exact and standard definition, different manufacturers according to their understanding of independent development of related products. service delivery platform is generally refers to provide uniform cloud application access and management, supporting application products pre-sale, sale and after-sale service, and it can speed up the application online release service platform, business delivery platform usually consists of application management, product management, user management, order management, billing and application functions such as supermarket makes parts. This platform business delivery of the platform mainly realizes the SaaS application management and provides for SaaS and cloud computing system connection ability, it is the user's mainly use platform. It includes three functions, the first one is the portal system which is responsible for the entrance of the system related work, the second is the system configuration which is responsible for the application of the system and resource management, and the third one is the user service which is responsible for the customer order related work. There is an relationship between them, and it can provide its own service for other SaaS application and the third party software.

2.5. Operation and Maintenance System

The operation and maintenance system can realize to manage the user and buying SaaS function, and it has many functions such as the time, the data quantity statistics, form order, form the offer and software operation service.

3. Application Analysis

The software industry is the state's strategic new industry, it is the important foundation of the national economy and social informatization. promote the software change the original work is the first condition to promote the industry's innovation ability and guarantee the healthy development of the software industry. this platform as the electric power industry information application system, it provides users with the involved in engineering design, project budget preparation, settlement management and a series of online application service, and it gives full play to the power engineering information data center online application service business value, and it enhances the user for the original software depends on this platform, as the electric power industry engineering technology and economic comprehensive application platform, so it will solve the electric power industry application software effectively, at the same time, it will provide effective help for reducing the enterprise cost and improving the utilization rate of resources.

Using the cloud computing platform, we can concentrate the IT resources to the data resources pool, and the developers need to apply for according to the actual use of IT resources, so the managers can monitor to the use of IT resources, including CPU, memory, and memory usage. at the time, cloud computing platform IT resources scheduling management and resource recovery function, can enhance the resource usage efficiency furthest, so it can avoid the waste of IT resources. according to the survey, the per capita PC IT resources utilization rate is less than 20%, but with the cloud computing platform, it can increase the IT resource utilization rate to 70%.

Using the cloud computing platform to deployment software system , completely through the systematization and standardization process, which can arrange all the work in

project group at the same time, and it reduce the deployment of software development life cycle, and it saves the cost of personnel. using the cloud computing platform, the service life of the average server is 5 to 8 years, and it is more stable, more processing power. as we know, the PC efficiency is low, the fact is about 1000 PCs equal to 10 to 15 table IBM X3850 server, according to the 6 years depreciation , it saves 40% IT cost directly.

4. Conclusion

Using Java technology to research and develop a SaaS development and maintenance platform which is based on cloud computing, it main includes four modules which are the cloud computing load network, the application server, the development framework, the cloud computing development engine, operation and maintenance system. the cloud computing load network is belongs to the infrastructure; application server has application startup, deployment, online update functions and user online state management , it mainly realize the centralized management of the server resources; development framework which is used in Java development tools to realize SaaS application development support, it includes interface development, application integration, distributed service access, debugging, deployment, and other functions, it provides with the operation and maintenance system interactive ability, and it can realize to control the user according to the use's the software function; cloud computing engine is mainly for SaaS application which can provide cloud computing services, and according to the calculation amount automatic task or storage request distributed to cloud computing server group focus for SaaS software provide computing and storage capacity; operation and maintenance system to realize the user and buying SaaS function management, the data quantity statistics and software operation service of related functions. the platform can provide a complete network client software development scheme for the development of software and integration, it can reduce the user's request to SaaS technology, and it can help the user to achieve operation service of product on the Internet. at the same time, the platform as a development tool can be used as a powerful supplement of core electronic devices, high-end general chip and basic software products.

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References

[1] A.losup et al. "Performance Analysis of Cloud Computing Services for Many-Tasks Scientific Computing". *IEEE Trans. Parallel and Distributed Systems*. 2011; 22(6): 931-945.
[2] C.Vecchiola, S.Pandey, and R.Buyya. "High-Performance Cloud Computing: A View of Scientific Applications". Proc, 10th Int'l Symp. Pervasive Systems, Algorithms, and Networks (ISPAN 09). *IEEE CS*. 2009: 4-16.
[3] J Li et al. "eScience in the Cloud: A Modis Satellite Data Reprojection and Reduction Pipeline in the Windows Azure Platform". Proc.2 010 Intl Symp. Parallel & Distributed Processing(IPDPS 10). *IEEE CS*. 2010: 1-10.
[4] J Dean and S Ghemawat. "Map Reduce: Simplified Data Processing on Large Clusters". Comm. *ACM*. 2008: 51(1): 107-113.
[5] Jeffrey Dean and Sanjay Ghemawat. Mapreduce: Simplified data processing on large clusters. *Commun.ACM*. 2008; 51(1): 107–113.
[6] I Foster, Y Zhao, I Raicu, and S Lu. "Cloud Computing and Grid Computing 360-degree compared". *in Grid Computing Environments Workshop*. 2008; 1–10.
[7] G DeCandia, D Hastorun, M Jampani, G Kakulapati, A Lakshman, A Pilchin, S Sivasubramanian, P Vosshall, and W Vogels. "Dynamo: Amazon's highly available key-value store". in Symposium on Operating Systems Principles. *ACM*. 2007: 205–220.
[8] P Watson, P Lord, F Gibson, P Periorellis, and G Pitsilis. Cloud Computing for e-Science with CARMEN.In 2nd Iberian *Grid Infrastructure Conference Proceedings*. 2008; 3–14.
[9] P Mell and T Grance. "Effectively and Securely Using the Cloud Computing aradigm (v0.25)". Presentation, *US Nat'l Inst. Standards and Technology*. 2009.

[10] M Haynie. “Enterprise cloud services: Deriving business value from Cloud Computing”. *Micro Focus, Tech. Rep*. 2009.
[11] M Armbrust, A Fox, R Griffith, A Joseph, R Katz, A Konwinski, G Lee, D Patterson, A Rabkin, I Stoica, and M Zaharia. “*Above the Clouds: A Berkeley view of Cloud Computing*”. University of California, Berkeley, Tech. Rep. 2009.
[12] Amazon EC2. http://aws.amazon.com/ec2.
[13] Hadoop. http://hadoop.apache.org.
[14] Open Cloud Consortium. http://www.opencloudconsortium.org.