2011 International Conference on Computer Science and Information Technology (ICCSIT 2011)
IPCSIT vol. 51 (2012) © (2012) IACSIT Press, Singapore
DOI: 10.7763/IPCSIT.2012.V51.96

The Power Marketing Information System Model Based on Cloud Computing

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Abstract. Power marketing systems based on power supplying areas are no longer apt for the current electricity informatization. New technologies are required to update them and to overcome the original shortcomings, then to complete new systems that meet the needs of power grid informatization. After researches on the cloud computing technology, we found that power marketing systems constructed on private cloud can effectively solve the problems of present systems. We integrated resources of provincial grid corporations and achieved informatization of grid corporations using the below-mentioned power marketing system model based on cloud computing. Therefore, this model is of great value to the construction of provincial power marketing systems.

Keywords: cloud computing, power marketing system, system model

1. Introduction

Power marketing system is one of the most important business platforms in grid corporations. Its key businesses include operation expansion, power measurement, power usage management, business billing and line loss management. Above all the business modules, service modules and analyzing modules are provided. Service module includes telephone service, internet service and client center service. Moreover, it emphasizes providing all sorts of high quality services. The analyzing module, however, includes comprehensive business consultation, statistics based on historical data; efficiency analyzing and decision support, and emphasizes providing timely and accurate decision foundation [1]. Thus, power marketing system provides powerful support for the producing, dispatching, marketing and service for grid corporations. It is able to effectively process and manage all kinds of business data of the grid corporation, and so bringing its overall management level, working efficiency and service quality to a higher level. So it's counted as an important information platform for grid corporations.

After over twenty years of power informatization, grid corporations have accumulated great deal of experiences for the construction of power marketing system. However, due to the level-to-level administration, those systems between different areas and different grid corporations are essentially disrupted without a uniform standard. Problems such as low sharing and repeated construction also exist. As the requirement for power informatization rises, several new power informatizing ideas are becoming prevalent among grid corporations. Provincial grid corporations should follow these principles and update the original marketing system to meet the needs of the power informatization at present. During the informatization construction, provincial grid corporations still face problems. For example, how to protect the original investment so that the original resources can still function well under the new network construction, the new computing model and the new service model in the update is one of them.

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After researches, we found that using the information system construction based on cloud computing, the problems mentioned above can be effectively solved. It obviates Information Island and repeated construction, and at the meantime facilitates applications like intelligent client service, bulk data searching and decision support. To achieve this, we proposed The Cloud Computing Model of Power Marketing System, which completed the goal of centralized business information system management upon resource integration, and which is of great value to the construction of provincial power marketing information system.

2. The current situation of power marketing information system

A traditional power marketing information system is usually completed by one of the grid corporations in each power supplying area, which is a product of traditional administrating system. Though the reformation of power system has taken place several years before, this management pattern is neither reformed already nor easy to be reformed. That's why the traditional management pattern is still in application in some areas. There is still another reason in the formation of this management pattern. Due to the unbalance of the economic and social development in different areas, the electricity policies and fee are quite different. Moreover, grid corporations overemphasize their own regional characteristics and the standard for the power marketing system construction is in paucity, as a result the power marketing information systems differ from one area to another, making it hard to assemble provincial data and services.

In order to solve those problems, the State Grid Corporation and the Southern Grid Corporation proposed their own solutions, respectively. Feasible applications and strategies are also made, acting as very good guidance for subordinate grid corporations. But these solutions are too ambiguous as for standard, making it hard for them to substantially unify the construction of information systems.

The State Grid Corporation has put forward the SG186 project[2], which aims at building an integrated enterprise information platform and construct the Eight Business Applications known as financial management, marketing management, production safety management, coordination business, human resources management, materials management, project management and comprehensive management. And at the meantime, establish the Six Security Systems known as sound management controlling, comprehensive evaluation, safety protection, standards and norms, technical research and the team of talents. And moreover, it plans on gradually building the digital grid and informatized enterprise, providing forceful information support for the construction of good corporations. However, after several years of construction, there still are some corporations that haven't achieved the construction goals.

The Southern Grid Corporation raised the 123 Project [3], whose core lies in the integrated information system based on SOA (Service Oriented Architecture) information technology. It combines the flexibility of IT and the flexibility of service through SOA, so making the in-respond-to-requirements and quick response market possible and finally reaching the goal of digital support, informatized management and intelligent analyzing. However, the subordinate corporations of Southern Grid Corporation haven't unified their informatizing pattern and their information technology model, so problems in the information development and information sharing occur. This is not good for the continuous development for the enterprise [4].

In all, it's very important to establish a unified and efficient information platform for grid corporations in order to build an intelligent grid featuring informatization, automation and interaction. Cloud computing is the foundation of this goal.

3. Cloud computing and its architecture

Cloud computing[5] is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction. The cloud platform makes use of the virtualization technology to provide users with the resources they want, and dynamically withdraw the resources when not in need. With cloud computing, average users can also perform large scale parallel computing and data manipulation. It's a brand new developing direction of the next generation of internet computing platform.

Cloud computing can be sorted into three categories by service mode: public cloud, private cloud and hybrid cloud.[6]-[8]

Public cloud is provided by third party service providers, who link computing centers on the Internet together to deal with computing and storing tasks. Public cloud can contain millions of computers or servers and can use all sort of software and can also have powerful storage system. As a result, users in public cloud no longer need powerful computing terminals; instead they can obtain computing ability and storage from the cloud and pay by usage. Then users are able to transfer computing and data resources to the cloud, realizing super-computing and super-storage with far less cost than the present computing and storage architecture.

Private cloud is constructed and used inside a single enterprise. IT capability is supplied to insiders of the enterprise in the form of service. For large enterprises, private cloud is a new way to construct intranet. It enables them to centralize computing capability and as a result provide service for operating departments in different locations. Meanwhile, enterprises can manage a system as if managing a single object through private cloud, thus successfully integrate resources.

Hybrid cloud combines the cloud environments of public and private cloud. Users themselves choose the appropriate integration way and raise the strategy of using hybrid cloud according to their own requirements. Users should usually evaluate their own requirements via several criteria such as information security requirements, and then put corresponding data in the public or private cloud respectively. Hybrid cloud is highly extensible, making it the first choice for enterprises.

Public cloud has a great advantage in the cost, while having a big defect in information security. Plus, there are still not enough applications for public cloud, so its applied range has been largely restricted. Private cloud is considerably safe, but its running and supporting cost is too high for some minor enterprises to afford, restricting its application too. Hybrid cloud combines the advantages of both types of clouds and also avoids some of their shortcomings. Nonetheless, hybrid cloud is a balanced choice, which doesn't promise ideal outcome either.

4. Power marketing information system model based on cloud computing

The power industry is not only an industry of high automation level, but also an industry with rapid informatization development. The industry has accumulated a lot of IT infrastructure and resources through long-term information construction. Therefore, we must give full consideration to the protection of existing resources during the transformation of information construction, meanwhile play to the advantages and efficiency of the new system, and achieve win-win.

4.1. System model

This model is designed for the management structure of provincial power grid corporations. Usually the provincial grid corporations own powerful IT operation and maintenance organizations, and have high requirements for the security and stability of information system. Therefore, the architecture of this model is based on the private cloud, which is shown in Figure 1.

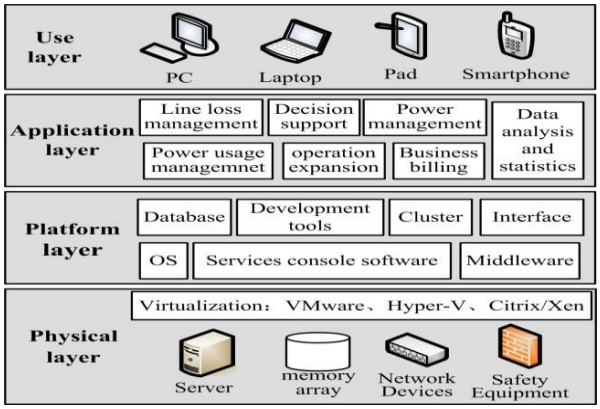

Fig. 1. The power marketing information system model based on cloud computing

Physical layer: the bottom of the infrastructure in the model, including hardware resources at all levels of computing centres of grid corporations. We can build HaaS (Hardware as a Service) which is on-demand distributable, flexible, scalable and manageable with virtualization technology, and achieve the integration of the hardware resources. Integrating the existing resources in the physical layer not only greatly saves the cost of the system transformation, but also reduces the risk of hardware resources being idle and underutilized.

Platform layer: the most important system software interface in the model. Because the hardware resources are made into different virtual machines at the physical layer, different operating systems as well as database systems, middleware, development tools, interfaces, software, etc. need to be installed on the virtual machine, and achieves coordination under the control of the service console software and clustering software. This forms PaaS (Platform as a Service) in the system model and lays the foundation for the use of application layer software.

Application layer: the deployment layer of the power marketing management information system, providing all functional modules needed by the power marketing information system. Users could choose software modules according to their own needs, and store the data into the dedicated storage service modules. This structure is typical for SaaS (Software as a Service) environment, and its value lies in the users' access to the software system: it's in the form of service. So the user does not possess the software resources exclusively, which effectively improve the utilization of the software and at the meantime achieve centralized management, protecting the needs of the power marketing information system.

User layer: user access control layer. The users are divided into two categories, and the system accesses different applications to be processed according to different login. When the internal staff login, the system will carry out login certification, and determine the internal staff authority by the certification result, allowing him to enter the related applications. Outsiders can only log on the service modules in the marketing information system, and achieve the operations such as grid service application, inquiries, feedback and etc. to improve the service level and quality of the grid corporations. Therefore, the user layer is generally required to provide a variety of access methods as well as a simple interface for external personnel for their conveniences.

4.2. System architecture

According to the model designed and the actual situation of the grid corporations, we designed the power marketing information system architecture based on cloud computing, shown in Figure 2.

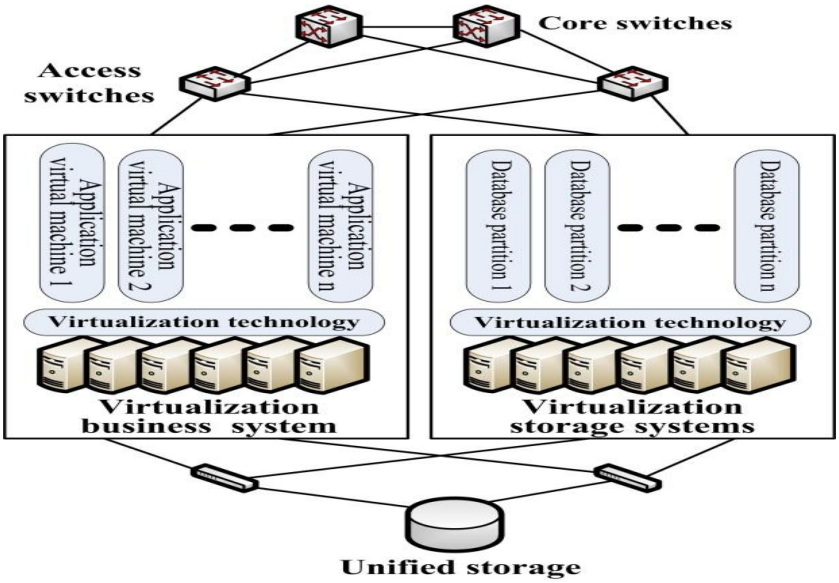

Fig. 2. The power marketing information system architecture based on cloud computing

In this architecture, the store uses a centralized unified storage. The advantage of this storage approach is mainly reflected as follows. Firstly, the unified storage goes perfectly well with the data-assemblage principle, which makes the construction idea easy to be accorded by the grid corporations. Secondly, the unified storage improves the efficiency of storage management, and storage managers do not have to rush

around in different places, which greatly reduce the costs of operation and maintenance of the system. Finally, the unified storage is advantageous to building a private cloud system.

Nevertheless, the unified storage requires high network performance. If the architecture is poorly designed, bottleneck of data exchange may be easily produced. Therefore, in order to protect the system's running stability, we've chosen the hot standby structure in the network design. At the same time, if conditions allow, we can also increase the disaster recovery system in the network.

4.3. Implementation strategy

It would be a long, gradual process to implement the transformation of the traditional management information systems within the enterprise. This problem can't be solved merely with executive order or enthusiasm for work. Therefore, this model should have a sound strategy in order to guarantee its successful implementation.

According to the long-standing experience in the information construction of China's enterprises, together with the actual situation of the information construction of provincial grid corporations taken into account, this model has to be carried out with the "incremental implementation strategy" so as to effectively guarantee the success rate and completeness of the model implemented. And finally complete a power marketing information system based on cloud computing that not only meets the business needs, but in line with the model standard.

The incremental implementation strategy is divided into four stages.

Phase I: Standardization.

Building the standards and planning of the cloud computing development of grid corporations. Require all levels of grid corporations to determine the goal of information construction, and make preparations for follow-up work.

Phase II: Integration.

Through proper migration, centralization and integration of the data centers scattered at all levels of the grid corporations, most of the computing centers can be gradually standardized and their own businesses and data can be essentially integrated. Also, the county-level data centers based on cloud computing will be built, which lays the foundations for putting in follow-up provincial cloud computing data centers.

Phase III: Virtualization.

Based on provincial grid cloud computing data centers, we could build the virtualization architecture of the entire network of data centers and the provincial data centers which regards applications as the core. Virtualization obviates the heterogeneity of different physical devices, which transforms virtual physical resources into standard virtual machines and virtual storage, and prepares for the deployment of cloud computing.

Phase IV: Cloud Computing.

Setting up the Provincial data center as a cloud computing center, together with further software deployment, we could implement the application-oriented power marketing information system based on cloud computing. The main tasks of this phase is the transformation from virtualization to cloud computing, including infrastructure optimization, service management unification, application development and core business integration, etc. This stage is the focus of all our work and the key to success. Therefore, details must be carefully deployed and all steps seriously implemented in order to ensure the realization of the overall goal.

5. Conclusion

Cloud computing is the IT infrastructure developed in recent years, and there are many issues that need to be researched and developed itself. Therefore, the introduction of cloud computing technology into the informatization construction of grid corporations is still at the exploratory stage. Cloud computing is not the panacea to the problem of power grid information construction, and it can't solve all the problems in the informatization construction.

This model just offers some reference to the informatization construction of provincial power grid corporations. After several years of construction, we hope that the information level of provincial power grid corporations can make obvious progress, and can provide us with affordable and high-quality electric power.

6. References

[1] HAO Xiaohong, ZHU Jie, WANG Weizhou et,"Application Status of Data Mining Technology in Power Marketing System",Industry and Mine Automation,vol.1,pp.68-71, Jan. 2011

[2] ZHANG HuaFen, "Model and Benefit Analysis on Database Integration for Application System of SG186 Business", Computer Systems & Applications,vol.19 (12), pp.199-203, Dec.2010

[3] China Southern Power Grid Co., Ltd, "The standards for application development and implementing technologies based on SOA architecture of China southern Power Grid Corporation (Exposure draft) ",2009

[4] Bingyuan Xu, Jianmin zhang, Xindong Zhou,"Information system architecture and model design for the Southern Grid Corporation", Electric Power Information Technology, vol.7(9),pp. 82-86,. Sept. 2009

[5] Wanyun Lei, "The strategies and practices of the informatization construction of enterprises", Beijing: Tsinghua University Press, Dec.2010

[6] Virtualization and cloud computing group, "A Practical Guide to Cloud Computing: Strategy Blueprint and Technical Architecture", Beijing: Publishing House of Electronics Industry, Jan.2011

[7] Cloud Computing Use Case Discussion Group. "Cloud Computing Use Case White Paper V4", http://cloudusecases.org/

[8] Wikipedia, "Cloud Computing", http://en wikipedia.org/wiki/Cloud-computing