

## Research on Operation Management under the Environment of Cloud Computing Data Center

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### **Abstract**

*In recent years, with the rapidly developing of technical and commercial related with cloud computing, many countries have issued the cloud computing development strategic plan. Characteristics of cloud computing technology determine the cloud computing platform operational mode cannot copy the existing business platform of operational mode. So exploring the data center operations in cloud computing environment system, to ensure the cloud platform and business platform of the bearing can be efficient, safe and stable operation becomes important issues in operations management. Cloud computing operations management should be emphatically from daily operation monitoring, security management and automated processing. Introducing ITIL V3 operations management, strategy, design, operation and continuous improvement to cover every stage, will push the success of enterprise cloud computing strategy.*

**Keywords:** *cloud computing, operation and maintenance management, ITIL*

### **1. Introduction**

Data center is the physical carrier of information and information system and usually be used mainly for resources storage and management of IT associated with the host, network, and storage devices. A data center can play the role of itself only when the data center can be well maintenance and management. Cloud computing is the development of parallel computing, distributed computing and grid computing, or it is the commercial implementation of these computer science concepts [1, 2]. Cloud computing describes all levels of service set from the hardware to the application and each level corresponds to a collection of services, which including: infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS). The characteristics of Cloud computing include it can acquire on-demand self-service by access the network, virtualization and resource pooling, automation, high scalability, high reliability, general, cheap and be charged according to the use of Cloud computing service[3]. From the service model perspective, cloud computing is a new model of delivery, useable and calculation of new resources. In this mode, IT resource, data and applications available to users, all of these are as service through the network. From the technical architecture perspective, cloud computing is a fundamental framework of methodology, a large number of calculations composing of resources IT resource pool; it can create a virtual dynamic resources for users to use [4].

Through effective implementation of cloud computing data center operations management, reduce the staff workload and improve operations staff work efficiency, guarantee the working efficiency of the business personnel, improve the running status of the business system, in turn, improve the enterprise overall management efficiency, realize the maximization of the value of cloud computing data center.

## **2. Operation and Maintenance Management Ideas of Cloud Computing Data Center**

Data center operation platform is an important component for ensuring the normal operation of the enterprise system; it can act as the distribution operation platform for the maintenance, management and application resources. Different to the traditional IT management, cloud computing operations teams may face tens of thousands of servers, storage and networking equipment and the infrastructure environment based on the security of this platform. A super large scale cloud computing center need effective ways to reduce the operation cost of operation and maintenance management. Cloud computing is mainly manifested as the centralized operation and maintenance management, resource pooling and automation. By thousand, ten thousand or more machines from the logic synthesis of the whole cluster, the platform provides computing power and mass higher storage space for user. Increasing resource prices and development management equipment amount must push the automation operation technology and ensure the availability of services, stable and efficient.

Range of cloud computing environment which covered in operation and maintenance management is very extensive and includes several services, such as service on-demand, infrastructure management, physical equipment, system management, data management, management tools and personnel management etc.. To achieve the above goal of good management, it is necessary to realize the calculating of daily monitoring, operation maintenance management of standardization and maintenance of automatic processing of the cloud.

### **2.1. Daily Operation and Monitoring**

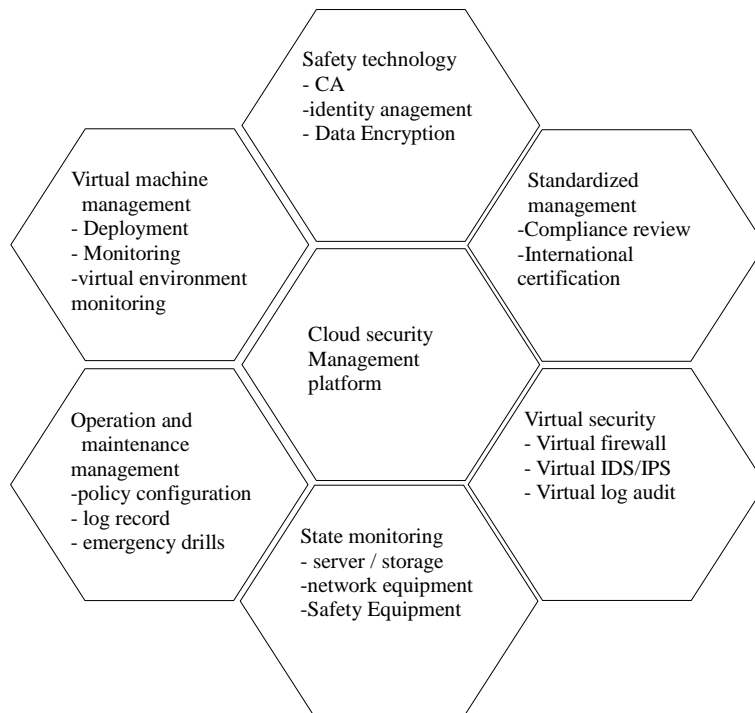
Monitor daily operation management of Cloud computing should be realized from the state of infrastructure, network environment, equipment performance, event management, change management and emergency plan management and other aspects of the full range of cloud computing. By running good monitoring of cloud computing, it can realize the unified management service of each system, unified collection of all service operation system and application information, realized the comprehensive analysis, induction and summary of different levels of information. Operation monitoring effectively to the system can send warning to system administrator advanced, which can avoid the system failure and cause enterprises to suffer the enormous economic and reputation loss effectively.

### **2.2. Standardized Safety Management**

Safety management is the key problem in the operation and maintenance management of cloud computing. 15 cloud computing security focus areas which defined by Cloud Security Alliance(CSA) are: information lifecycle management, the government and the enterprise risk management, regulations and audit, general legislation, e-Discovery, encryption and key management, authentication and access management, virtualization, application security, portability and interoperability, response, notification and repair of operation and management accident of data center, traditional security effect (business continuity and disaster recovery, physical security), system structure *etc.* [5].

Standardized of cloud computing security operating and management and combined with the security management strategy of security technology, level protection, virtualization, virtual machine, operation safety management system can realize enterprise IT assets management effectively, include tracking and auditing the enterprise important documents, taking in charge of the media and equipment which possible leaks or spread of the virus effectively, security classification management, recovery operations and illegal software disable for client *etc.*. Through the standard safety management can

solve the security problems caused by cloud services effectively, strengthening security operation management and making technology service safety, enhancing the confidence of enterprise and user to use a cloud service safely. Specification for deployment model is shown as in Figure 1.



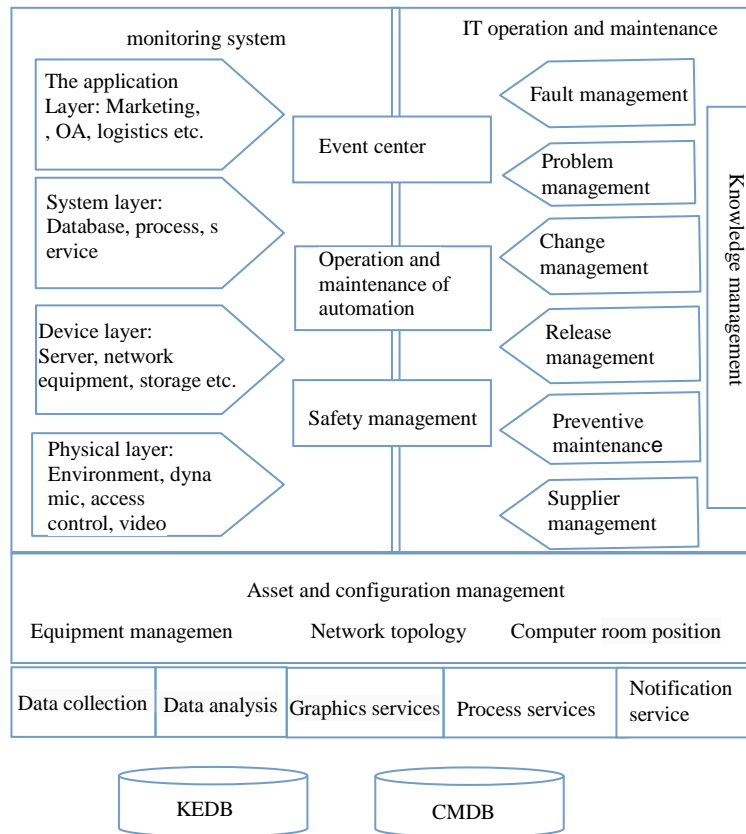
**Figure 1. Safety Specification for Deployment Model**

### **2.3. Operation and Maintenance of Automatic Processing**

It is almost impossible to use the manual mode of operation to the cloud computing system maintenance for the cloud computing system is in large scale, complex structure. Cloud computing systems need to achieve on-demand service, which makes the automation system operation is inevitable. Under Cloud computing environment, the need for automated place is very much; mainly refer to provide customer oriented virtual sharing system and resource optimal system. Monitoring system and automatic operation mechanism perfect will play a decisive role on the improvement of productivity. Cloud computing operation management model is shown as in Figure 2.

### **3. Implementation Strategy of Operation and Maintenance Management of Cloud Computing Data Center**

In order to promote optimization and improvement of the cloud computing operation management, it's necessary to build the integration operation management mode. Putting the business oriented in the first place, construct a perfect and mature IT operation service system.



**Figure 2. Cloud Computing Operation Management Model**

Cloud computing operation management is the longest stage in the life cycle of cloud computing data center. From the application architecture design, software and hardware resources configuration assessment, application service performance bottleneck evaluation to the safety protection and system optimization, operation and maintenance personnel are required to participate in. Therefore, the improvement of operation and maintenance management of cloud computing should be from the daily monitoring, security management, platform maintenance, fault treatment, configuration management, service acceptance and other aspects. With the use of automation and maintenance tools, realize the unified management of physical resources and virtual resources. By providing end to end management capabilities for resources management, statistics, monitoring, scheduling, service management etc., realize efficient, convenient, intelligent, unified and integration operation and maintenance management for cloud data center.

### 3.1. Construction of Safety Controllability of Cloud Computing Data Center Operation System

Life cycle of a large cloud computing data center begins its planning stage. Planning and design can define the incubation period for data center. From the beginning of the verification by the data, center put into production formally. Authentication service is the starting point of cloud computing data center operation. Data center operation team should be actively involved in the verification process, take the opportunity to be familiar with the system and equipment, prepare manuals and accumulation of emergency process documentation for the latter part of the operation and maintenance, and practical experience. At this time, good data management center can greatly reduce fault rate. But

if lack of well operation management, even with Tier 4 level hardware investment, Cloud computing center may also has a relatively high failure incidence rate.

There are three key factors can affect the operating and maintenances of the data center, including: qualified personnel and clear organization structure, careful maintenance procedures, rules and regulations, improve the continuous training and ensure the operating personnel understand the latest configuration and operation process of the specific room. Data center event can not be avoided, cloud computing data center has the huge number of events, from the operation and management personnel's point of view, it is important to know the reason of the event and minimize the possibility of convert event into the failure. A consequence of incident is saving or fault. In all remedial measures, preventive maintenance contribution accounted for 19%, while the maintenance personnel involvement accounted for 29%. The critical factor to ensure the stable operation of data centers is the qualified site personnel. Technical ability of field staff should be high, can complete responsibility. The experience of data center operation person is richer then the center is more security reliability. Data centers with high reliability or can run all the time of 100% must be all-weather (24\*7) maintenance personnel on duty.

In order to obtain the high availability data center, enhance the level of operation and maintenance management, large-scale cloud computing data centers need to continue to carry out self-evaluation, self-diagnostic analysis of their own core strengths and weaknesses, and solve at last. Another path of fast lifting maintenance level is to get an international operation management certification, or to have the appropriate experience and expertise to obtain professional advice and guidance. In addition, the cloud computing data center must construct the emergency management system and emergency treatment measures to ensure that after fault event happens, the adverse effects of emergency events can be eliminated as soon as possible and recovery the continue operating.

A unified event management center should be built in Cloud computing data center operation system in order to collect fault and event aggregation of each system and deal with all faults with filtering, forwarding, and automatic responding and alarm processing. Event management center link the various system fault and event, complete event level integration and finish the implementation of application transaction monitoring level. At the same time, monitor the running status of the infrastructure and IT infrastructure to achieve the real-time discovery and notification of the failure and the exception; collection and arrangement of monitoring data could provide the basis for analysis for capacity management, incident management, problem management, compliance management , and ultimately to achieve the goals of data center high availability [6].

### **3.2. Industry Standard ITIL V3 for Theoretical Guidance**

ITIL, which means Information Technology Infrastructure Library, is a set of IT service management standard library which was developed by CCTA at the end of the 80's in twentieth Century. It is a methodology based on process, it put the British each industry best practices in IT management together to form a standard, which includes the description of how to manage IT infrastructure process, and it takes the process as the guide, takes the customer as the center, through the integration of IT services and enterprise services, it can improve the level and ability of enterprise IT service providers and service support. ITIL provides a suitable set for IT service management practice guidelines, also provides an objective, rigorous, quantitative standards and norms for the IT service management practice. ITIL can guide the organization to use the technology efficiently to make the existing resources play a greater effectiveness [7].

ITIL V3 is a new ITIL framework which is put forward from the point of the business service from IT to the enterprise, and it mainly is based on the best practice which serves life cycle management [8, 9]. Through the comprehensive unified construction of

workflow management subsystem, we can achieve the organic integration of personnel, technology and processes, realize the organic integration of personnel, technology and process to achieve the process automation, by the automatically scheduling of workflow engine, automate the process, and it's convenient for operation person to finish the daily operation by using related management process, in order to improve the IT quality of service and maintenance of sector productivity.

ITIL operation and maintenance management system is widely used in the world based on cloud computing, in this background, the implementation strategy of ITIL V3 system can refer to the following implementation strategy [10].

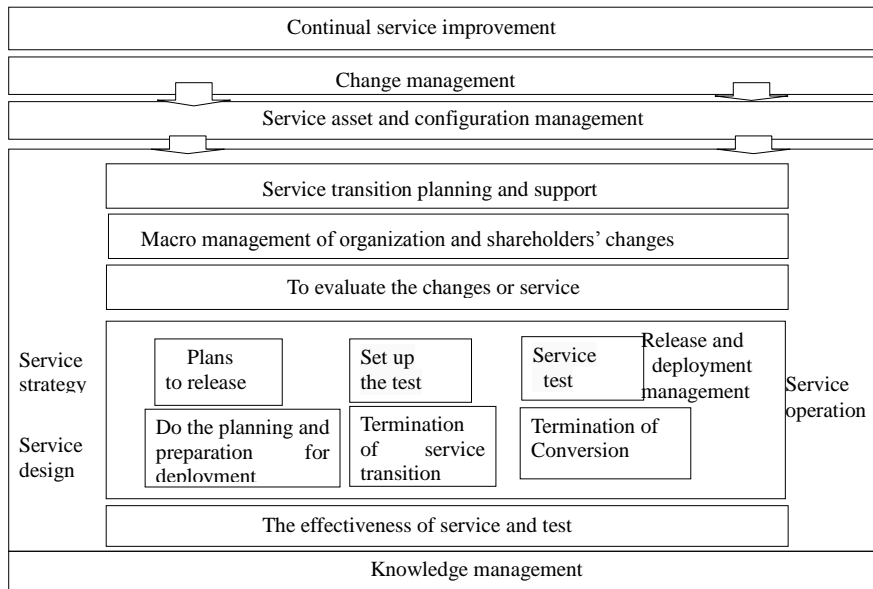
(1) Service strategy. Service strategy is the core of the lifecycle of an ITIL service, service strategy module proposed service management in the process of practice throughout the ITIL service policies, guidelines and procedures of one lifecycle. Service strategy is the basis of service design, service transition, service operation and service improvement. It provides guidelines and priorities for service providers to invest. By using the method of market driven, Service strategy introduces new concepts such as value creation, business case analysis, market analysis; the ultimate goal is to improve the economic life of service. It includes the following processes: service and product portfolio management, demand management and IT financial management.

(2) Service design. Provide design guidelines for other aspects of IT service design, service process and service management. Service design is to guarantee the new service or service changes, which can meet customer expectations through the effective design. It is concerned about the technology about customer and service delivery, which is not only the design of the technology itself. Management process is a part of service, service design must consider the management systems and tools needed for monitoring service in addition, but also consider the mechanism which can effectively measure the grade of service, technology and process. It includes the following processes: the service catalogue management, service level management, risk management, capacity management and availability management, IT service continuity management, information security management, compliance management, IT architecture management, supplier management.

(3) Service transition. In the service stage of transformation, we will build, test the content designed during service design stage, and then put it into production, to ensure that customers can receive required commercial value. The problem to deal with during this stage: changing management, assets, configuration items (hardware and software), the validation service, test, transferring production services, all of these will ensure that the service provider's personnel, processes and systems can deliver the services to end users, and finally meeting service level agreement requirements. Service transition stage specifically includes the following processes: service asset and configuration management, service validation and testing, evaluation, release management, change management, knowledge management. Configuration management is managing and timely providing accurate and reliable cloud infrastructure configuration information to make the cloud services provide efficient resource. The implementation of configuration management can quickly understand the impact of the changes, and execute the change more rapidly and effectively.

(4) Service operation. During the service operation stage of life cycle in cloud computing services, special services and value will be delivered delivery to the customer directly. Work also includes monitoring and fast recovery of fault time, judging the root cause problem, judging the related trend of events which occurred repeatedly; service opening to satisfy the demand and the access of management and service. Service operation stage specific includes the following processes: management, event management, fault management, problem, the performance of the services requested, access management *etc.*.

(5) Continual service improvement. Continual service improvement (CSI) stage is to make the IT services continue to maintain a consistent process and business requirements, namely the implementation of improvements to support business process for IT service. CSI covers the whole life cycle, provides a mechanism for measuring the service, and provides the adjustment / optimization systems and processes to achieve improved mechanism of management in the entire life cycle. Specifically, CSI supports the following processes: service level management (SLM), service measurement and reporting, continual service improvement. The model is shown in figure 3.



**Figure 3. Implementation Strategy of ITIL V3 System**

The implementation of IT service management is a continual service improvement process. As the international standards of IT service management, ITIL is clearly on the definition of the logical relation between each process strictly, and provides a "best practice" guidance for us.

### 3.3. Deploy Automation Tools

IT service management can automatically adjust the required resources according to load change, in order to respond a balance between timely manner and cost saving: at the same time, and the computing power has a increasingly large scale, artificial management resources are increasingly not practical. These new features have put forward higher request to the IT automation management capabilities, enterprises often hope to get a higher degree of automation in the premise of not failure activities.

Cloud computing data centers need to deploy automation management platform, then centralized manage virtualization and cloud computing platform, provide automation solution for custom rules customization function, the user through the use of event trigger, data monitoring trigger way to manage automatic, in order to save manpower and improve the response speed.

## 4. Problems and Development of Cloud Computing Data Center Operation Management

The development trend that cloud computing services replace the IT system of enterprises cannot be avoided. In order to make cloud computing completely effective, the

corresponding cloud computing operation management system is essential. At present, the cloud computing technology and business are still in a developing stage, and its operation management is also in developing stage, there are many subjects and areas need to research. For example, there is a lack of uniform technical standards, the cloud itself is the product of a lot of technical development of fusion, and the products developed by various manufacturers is very difficult to interconnect, the lack of standards make the operation management of cloud computing more difficult.

## 5. Conclusion

This paper puts forward the operation management of cloud computing data center should emphatically expand from the comprehensive monitoring operation management, a full range of security management and improved automatic operation mechanism three aspects, in order to effectively realize that providing services as required, infrastructure management, physical equipment management, system and data management and other aspects of management, cloud computing data center combined with ITIL V3 to form a operation management practice under the cloud computing environment, finally get the comprehensive and effective operation management response by the IT resource management, IT business management, IT operation management.

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