Energy Consumption Management of Virtual Cloud Computing Platform

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Abstract: For energy consumption management research on virtual cloud computing platforms, energy consumption management of virtual computers and cloud computing platform should be understood deeper. Only in this way can problems faced by energy consumption management be solved. In solving problems, the key to solutions points to data centers with high energy consumption, so people are in great need to use a new scientific technique. Virtualization technology and cloud computing have become powerful tools in people’s real life, work and production because they have strong strength and many advantages. Virtualization technology and cloud computing now is in a rapid developing trend. It has very high resource utilization rate. In this way, the presence of virtualization and cloud computing technologies is very necessary in the constantly developing information age. This paper has summarized, explained and further analyzed energy consumption management questions of the virtual cloud computing platform. It eventually gives people a clearer understanding of energy consumption management of virtual cloud computing platform and brings more help to various aspects of people’s live, work and son on.

1. Introduction
With the rapid global development of economy and culture and the arrival of information age, data centers’ high energy consumption has received much concern. Virtual cloud computing platform generated in frequent computer uses helps more people to solve many problems. People can put information in the cloud but that approach brings many problems to computer energy consumption management. The high-energy consumption problem is mainly manifested in two aspects: data center and processing area. Due to wide use of computers, it is more frequent used by more people, thus expanding the scope of data center. Based on the increased number of servers, the excessive energy consumption appears. The server utilization is not high so more effective electricity energy is further wasted.

2. Energy Consumption Measurement of Virtual Cloud Computing Platform

2.1 Concept of Virtual Cloud Computing Platform
Virtualization has a very wide range of coverage, where virtualized servers and storage are both included in the virtual cloud computing platform. For virtual servers, there must be a physical computer server separating the physical computer server out. Then, divide the server and make it many various virtual computers. For the upper level operating system and software, the virtualized computers have a strong independence and can meet different usage requirements. However, none of the virtual computers has a leading role. They just have a certain auxiliary functions. They are virtualized computers that the physical one separates into. Virtualization has been widely recognized today because it has been so closely linked with people’s lives that the different symbols on which they have represent different
meanings. The calculation method of the Internet is cloud computing. Based on actual needs of computer mainframe and virtual computers, useful resources and information are obtained on the basis of using the computer; finally, those information and resources are transferred to the computer and other devices.

2.2 Management Issues of Virtualized Cloud Computing Platforms

The operation of computer management demonstrates a good convenience because of its virtualization technology. When maintaining virtual data centers, we can let other servers accept those falsified virtual computers so computers’ applications can keep running. Although that way shows a superior convenience, it gives a lot of inconvenience to solve monetary issues, making fund raising much more difficult. Because of the increased data center network, it is necessary to purchase the broadband. In this way, computers need to be satisfied with more advanced equipment. In addition, because of virtualization technology application, some automation decisions in computer data centers can be changed and computers energy consumption can be effectively managed. So, a good processor is needed. It should be the latest and can obtain hardware virtualization support; simultaneously, hardware facilities with strict requirement should be chosen so that computer’s energy consumption problems can be solved because there might be thousands of virtual computers running on a physical one. Intensive energy consumption issues in data center mentioned above will seriously impact virtualized cloud computing platform management.

2.3 Energy Consumption Management Challenge of Virtual Computers

2.3.1 Operational Management Challenge. Due to the dynamic resource scaling of virtualization technologies, the total cost of cloud computing infrastructure is ultimately reduced, which makes the flexibility of load deployment more obvious. VMware researchers have analyzed real virtualization deployment scenario data, summarized management workflow in virtualized scene and evaluated the effective use of cloud computing data center resources.

When virtual data centers need to be maintained, we just need to move the virtual computer to another server. There is no need to terminate the application or shut down the virtual computer. While the migration of virtual computers requires a certain cost, a high performance network device should be used to meet the rapid migration of virtual computers. The introduction of virtualization technology can effectively change some decisions in data centers so to purchase a more stable and reliable hardware to ensure good performance of data centers is need. Besides, coordination and balance between system performance and cost should be maintained.

How much on earth does it cost to manage the virtualized scene? VMware has an effective record on 17 companies’ data centers. As shown in figure 1, it demonstrates each energy consumption condition of virtual computers.

| Table 1 Common Management Operations on Virtualized Cloud Data Center | Daily Average Operations of Different Sites | Daily Peak Operations of Different Sites |
|---------------------------------------------------------------|--------------------------------------------|------------------------------------------|
| Operation Type                                                |                                            |                                          |
| Virtual Computer Reconfiguration                               | 2.3                                        | 699                                      |
| Automatic Online Migration                                     | 51.0                                       | 3156                                     |
| Virtual Computer Start                                         | 90.0                                       | 1576                                     |
| Virtual Computer Turnoff                                       | 35.0                                       | 1535                                     |
| Virtual Computer Reset                                         | 4.6                                        | 176                                      |
| Package Installer                                             | 5.3                                        | 250                                      |
| Create Snapshot                                               | 4.8                                        | 56                                       |
| Snapshot Restore                                              | 7.0                                        | 101                                      |
| Snapshot Submission                                            | 13.0                                       | 19                                       |
| Virtual Computer Cloning                                       | 6.0                                        | 44                                       |
2.3.2 Energy Consumption Management Challenge. Because of the existence of virtualization technology, data center brings not only new features to daily management operations but also new challenges to energy consumption management operations. Virtual resources and material resources are independent from each other in virtualization platform management so the underlying material resources and the virtual resources observed by computers are different, especially in the process of migration. Therefore, the energy consumption management of client virtual computers becomes a focal issue. Besides, platform updates, fault handling and new node additions affect the inconsistency of data centers. Thus, heterogeneity is increased so the virtual computer should be invariable in terms of the changeable isolation and independence.

The first is to achieve energy consumption management operation of virtual computers. However, that method has some defects. For example, energy consumption management function cannot directly act on virtual computers’ hardware because these hardware resources have been virtualized so they are shared by multiple virtual computers. Besides, the direct access to hardware resources can affect their isolation performance. For example, virtual computers that increase the frequency of their physical nucleus to improve their service quality will have a significant impact on other physical nucleus. Some activities are even malicious, such as power consumption virus and so on.

The second is to make a full use of the hardware energy consumption management mechanism to promote energy consumption management operation. However, that method has certain limitations and problems because multiple customer virtual opportunities will take advantage together of energy management strategy on hardware level. For example, memory DIMM can be accessed through the same bus and the voltage level is shared, too. So multiple customer virtual computers would obtain the memory, which means that the specific energy consumption management operation of virtual computers will not to use this part and only reduce the memory bandwidth under bus adjustment. It will not, however, give a full play to the advantage of DIMM so DIMM can be terminated. A colleague’s disk can also reflect the same limitations. It has multiple partitions, each of which will be allotted to different client computers. When all partitions are set to a certain power state, the disk can be adjusted accordingly and then the energy consumption management of the disk partition level can be realized.

2.4 Energy Consumption Measurement of Computers’ Virtual Computers
For virtualized cloud computing, the most important is the visibility of energy consumption process. Because of the rapid development of informationization, visual information can help to get more solution ability for energy consumption management. Then, there is a problem need to consider and solve, which is the problem of energy consumption measurement of virtual computers. In the development era of computers, energy consumption management requires more for computer centers. Currently, many new studies point out computer servers provide a strong guarantee for energy consumption measurement because outdated computer processors also need corresponding solutions. The usage power consumption can be distributed into the unit; then, the system energy consumption can be solved by power supply test. That solution cannot be applied in virtualized environment because it cannot directly measure virtual computers’ energy consumption so that kind of limit become the biggest obstacle to measure virtual computers’ energy consumption.

In order to determine virtual computers’ energy consumption conditions in cloud computing system center, the utilization of computer’s virtual memory should be budgeted. But the usage of computer’s virtual memory cannot be accurately budgeted so the utilization of computer memory cannot be measured. Moreover, there is various loads in cloud computing data center and resource requirements and dynamic changes exist at the same time. So, it is not a simple thing to get accurate energy consumption of virtual computers in cloud computing data center. Finally, virtual computers’ energy consumption measurement should adopt new technology to conduct an observation. Only in this way can computers’ data workers know and conduct improvement and adjustment towards contents in virtual computers.
2.5 Analysis on Virtual Computer’s Energy Consumption

In virtualized computing network platform, physical nodes form the basis of most online energy consumption monitoring. Power meter can calculate the energy consumption out of the computer platforms so computer mainframe’s energy consumption should be well managed and the energy consumption within the system should be provided for the computer mainframe. The energy consumption statistics can be in accordance with computers’ energy consumption to reduce the energy management accuracy eventually. Therefore, a precise measurement of energy consumption management should be conducted. Use resources and energy consumption contour analysis method and virtual computer energy consumption contour analysis method to analyze and study each computer’s subordinating virtual computers. Some experts start thinking about optimizing energy consumption, using software programs to deeply study the energy consumption contour. They will also submit valuable information to relevant scholars, conducting energy consumption contour analysis on the scenario basis consolidated by servers of virtual cloud computing platform and then forming a new model to eventually solve energy consumption problems and guarantee the application’s energy consumption durability.

3. Energy Consumption Management Mechanism of Computer Platform

3.1 Summary of Energy Consumption Management Mechanism of Computer Platform

Because of the progress of science and technology, virtualized cloud computing platform is also in constant progress. There will be many problems arising from the development. Because of the wide popularity of virtualized cloud computing platform, the cloud computing network is in constantly update. Meanwhile, virtualization and cloud computing platform have more problems in energy consumption. Therefore, more development on energy consumption management mechanism should be ongoing. In computer platform management, energy management for virtual cloud computing platform should be divided into two parts and manage different levels with reference to different ranges that the management mechanism manages. Besides, a comprehensive analysis on computer and internal deep management level should be conducted.

3.2 Energy Consumption Management on Virtualized Layer

For energy management of computer platform virtualization, energy consumption management issues of computer platforms should get virtual computer manager involved. There are two brief ways: the first is that virtual computers conduct a full-course monitor on computer system and then the operational system’ management schedule should be undertaken by virtual computers under the computer platform; the second is that virtual computers should become a resource and get a full play in computers’ hardware energy consumption to maintain the original system because energy consumption management operation mode of the virtual machine is different. For the virtual computer manager, the virtual computer’s online migration support becomes its main feature. The virtual computer’s migration can integrate energy consumption perception, thus saving energy. Meanwhile, the computer mainframe can transfer with each other while the virtual computer forms offline migration if it is transferred from one physical mainframe to another, among which important information needs to be copied and then a good operation of the virtual computer should be realized.

3.3 Energy Consumption Management of Computer’s Cloud Computing Layer

The computer’s cloud computing layer provides effective management methods for other platforms through its issues of energy consumption management mechanism and finally realizes energy consumption management operation in virtual computer. In the cloud platform, virtual computer’s energy consumption management can realize hard flex, soft flex, integration and so on. Soft and hard flexes can help cloud computing layer to get more effective and long-term energy consumption management. Hard flex will show different skills because of different information the computer’s virtual layers have but it cannot correctly feedback information provided by computer’s virtual layers, so the
attention is shifted to soft flex. When computer processors are not able to run, soft flex will play a more detailed role and can reduce energy usage and promote sustainable development.

3.4 Analysis on Performance and Energy Consumption of Virtual Computers

Energy consumption management problem of virtualized cloud computing platform has a certain effect of energy saving. Nevertheless, the problem to be solved is to unify ongoing servers and then improve the phenomenon of excessive energy consumption of servers. The relationship between computer performance and energy consumption should be analyzed deeply during unifying servers; advantages and disadvantages in that should be analyzed in depth. Computer processors have variability, so it is only by integrating and unifying computer software that computer energy consumption issue can be effectively changed. Besides, energy consumption and performance of servers should be weighed and the resources should be reset. It is the only way to maintain virtual computer’s performance and energy consumption in a harmonious relationship and then help the virtual computer to get a more ideal energy consumption condition.

4. Epilogue

The world is constantly changing. Nowadays people are in Internet information age with advanced technologies. Computer realm is developing rapidly, constantly updating its theme, and innovating its development. Now, virtualized cloud computing platform has become quite mature so it is necessary to analyze in depth its energy consumption management so that it can effectively guide various industries’ development and lead human society developing towards the ideal information age.

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