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Energy Management & Cost Optimization in IDC Using Load Balancing in Cloud

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Abstract: Cloud computing is one of the emerging field which provide a data on web for accessing the data through web and it is supported by the Internet data center (IDC). A cloud resource encloses effective resources for the user requests. For the users request of data in web, Load balancing and energy consumption is the biggest issue in cloud IDC. It contains the thousands of server to share the data in cloud. In IDC Payment of a data center for energy and cooling may be larger than the overall investment in the computing system. Users of cloud consumed the more energy in both academic and industry. Therefore, minimize energy consumption with balancing the workload of resources is a main credit. For this here proposed the EMCO-IDC (Energy Management& Cost Optimization –IDC) to overcome the issues.

Keywords: Cloud Computing, Sharing Data, Energy Management, Load Balancing and IDC.

I. INTRODUCTION

Cloud computing is a distributed computing model which allows users to rent resources from the cloud provider [1]. It is an expansion and conception of a previous idea which covers computing potentiality as common utilities, such as water and electricity, as predict by computer scientists in 1960s. In a cloud environment, multiple cloud users request is based on the on-demand resource provisioning with a pay-per-usage charge model [2]. Hence it is supported by infrastructure known as Internet data center (IDC). In this IDC, energy management is one of the great issues of IDCs which were paid great attention for both academia and industry.

Cloud resources contain effective resources for the user requests. While in cloud the physical resources were shared across a multiple processor quests through virtualized and stipulated manner. Here the virtualized resources are demonstrated by a set of restrictions recitation the processing, storage and the space which they needs. Stipulated cloud can be made by mapping the virtualized resources to physical ones. And also the hardware and software resources are allotted based on the on-demand basis to the cloud applications [3]. By allocating the resources in the cloud they must have the efficient energy for transmitting the data.

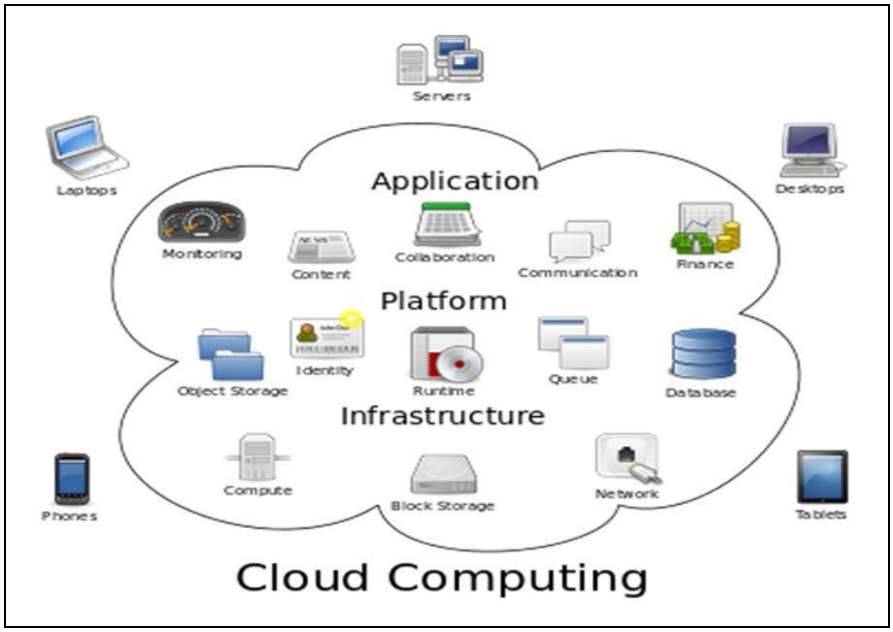

Fig 1: Cloud Platform on the web

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In recently, both academia and industry have paid great attention for energy management in IDCs. Moreover, IDC operators are tackled with two major challenges: the indecision in workloads of user requests, and the demand for service impairment guarantee. From the assessment of a cloud provider, envisioning the vibrant nature of users and their demands are unrealistic. Clouds users want to acquire the numbers of job have to complete on time with a minimal cost. Because of the limited resources with the congested world for satisfying the environmental necessities, locality restrictions problems and dynamic in nature of resource demand cloud provider need an effective energy management method for cloud environments. IDC is an Internet data center; it provides the megawatts of power for running and cooling the equipment for many servers for the access of the cloud [4].

Load balancing and energy consumption is the biggest issue in cloud. Payment of a data centre for energy and cooling may be larger than the overall investment in the computing system [5]. Therefore, minimize energy consumption with balancing the workload of resources is a hot topic not only cloud computing but also in other areas. The propose technique is suitable in dynamic workload and temperature balancing in a cloud environment. Their goal is to save maximum energy of the data center. In this approach, we identify the dynamic threshold value of resource utilization and define temperature threshold. It decreases the feasting of maximum resources, control the temperature of the processor and maximum minimize the energy consumption using their proposed technique called emco-IDC (Energy Management& Cost Optimization – IDC)**.**

II. LITERATURE REVIEW

Weiwei Fang, et al [6] assume the demand on online services and cloud computing has kept increasing in recent years, the power customization and cost related with cloud data centers' process have been uprising suggestively. In most existing research work focuses on decreasing power consumption of data centers. Nevertheless, the decisive goal of cloud service operators is to reduce the total processing cost of data centers while guaranteeing the quality of service such as service delay to the end users. From this author work it exploits both the workload transmitting and the service provisioning to address the total electricity cost decreasing problem. This problem is expressed as a categorized capacitated median model based on mixed integer linear programming (MILP) technique. Widespread assessments based on real-life electricity price data for multiple data centers show the efficiency and efficacy of their approach. The author investigates an emergent and important problem of minimizing the total electricity cost for cloud data centers under a multi-electricity-market environment. We propose a scheme based on the hierarchical capacitated median model to minimize the total electricity cost while guaranteeing the QoS to end users.

M. Ramani and Mohammed H. [7] analyze the Cloud computing offers business-oriented IT resources and IT services delivery as usefulness to users worldwide. The huge rising rate of the practice of large-scale data centers on cloud has request for computational energy. Datacenters presenting cloud applications ingest huge amounts of electrical energy. As an outcome, the cost is supporting by energy consumption and cooling of the datacenter. It may upturn complete investment on the computing. Therefore, decreasing of energy consumption and stability the temperature of resources are a most important in Cloud Computing. We are working on VM relocation mechanism. The goal is decreasing the energy consumption with thermal aware load balancing in a Cloud center. Energy hoards are reached by incessant consolidation of VMs according to current utilization of resources and thermal temperature of computing nodes. In their propose work, they have measured the condition of over-utilization, under-utilization by using resource utilization threshold and control temperature of the host using temperature threshold.

Yuan Yao [8], From this work they focus on a stochastic optimization based approach to make distributed routing and server management decisions in the context of large-scale, geographically dispersed data centers, which suggestions important possible for exploring power cost reductions. Their work reflects such decisions at diverse time scales and offers demonstrable power cost and delay characteristics. The usefulness of their method and its robustness are also illustrated through simulation-based experiments under delay tolerant workloads. Their proposed solution exploits temporal and spatial variations in the workload arrival process (at the front end servers) and the power prices (at the back end clusters) to decreases power cost. It also simplifies a cost vs. delay trade-off which permits data center operators to reduce power cost at the expense of increased service delay. Hence, their work is suited for delay tolerant workloads such as massively parallel and data intensive Map Reduce jobs. Today, Map Reduce programming based applications are used to build a varied array of web services – e.g., search, data analytics, social networking, etc. Hereafter, even though their proposed solution is more effective for delay tolerant workloads it is still relevant to many current and future cloud computing scenarios.

DzmitryKliazovich et al, [9] analyze the Cloud computing data centers are becoming increasingly popular for providing computing resources. Hence, the overheads of these data centers has skyrocketed through the increase in computing capacity with large percentage of the operational expenses due to energy consumption, specifically in data centers that are used as backend computing infrastructure for cloud computing. This chapter highlights the part of the communication material in energy consumption and presents solutions for energy efficient network aware resource allocation in clouds. There are two main alternatives for reducing the energy consumption of data centers: (a) shutting down devices or (b) scaling down performance.

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Daniel Gmach et al [10], study the advances in virtualization technology are enabling the creation of resource pools of servers that permit multiple application workloads to segment each server in the pool. Sympathetic the nature of initiative workloads is crucial to properly designing and provisioning current and forthcoming services in such pools. This paper considers issues of workload analysis, performance modeling, and capacity scheduling. Their goal is to systematize the effectual use of resource pools when hosting large numbers of enterprise services. A workload examination reveals the business and repetitive nature of initiative workloads. Workloads are robotically classified permitting to their episodic behavior. The resemblance among frequent occurrences of patterns is assessed. Artificial workloads are produced from the patterns in a manner that maintains the periodic nature, business, and trending behavior of the workloads. This study concerning six months of data for 139 enterprise applications is used to apply and evaluate the enterprise workload analysis and related capacity preparation methods. The outcomes show that when combining to 8 processor systems, they predicted future per-server required capacity to within one processor 95% of the time. The accuracy of predictions for required capacity suggests that such resource savings can be achieved with little risk.

Ankita Sharma et al [11], study the Cloud computing is an expanding area in investigation and industry today, which comprises virtualization, circulated computing, internet, and software and web services. Author's presents a method for scheduling algorithms that can maintain the load balancing. From this work they have established power optimization algorithm which over comes the limitations of the previous algorithms[Round Robin, Equally Spread Current Implementation Algorithm, Throttled Load Balancing which are used for the over load management of the data leading to positive consequences in terms of overall power consumption of the data center thus helping in green computing. As due to undue excess of traffic flow and then overhead due to mitigation and migration of the virtual machines to balance out the operations there is always an impact on the power consumption, if there is more overload, there is bound to be more power ingesting, and if balancing works well, there is bound to be an optimized trade-off for energy consumption. Results have shown that overall impact of power consumption is reduced by using the proposed algorithm.

Vijaya -Kumar-C et al [12] their development is based on, difficulty data exhaustive applications are increasing in cloud computing. We know that it can reduce investments, human resources and enhance productivity. Data centers play a key role with rapid growth online services of client demands in terms of providing the infrastructures as services (Iaas). For data exhaustive application needs more number of data centers and also massive amount of energy used to operating the servers. Due to increases in data centers in different locations its impact on environment in terms of increased the carbon footprint. We proposed virtual machine migration (VMM) technique to optimize data centers, satisfy performance resource distribution, and reduce the server disappointments and also energy consumption. To reduce the energy consumption, they are proposed virtual machine placement and dynamic load balancing algorithms.

III. PROBLEM DEFINITION

From the previous work they find out the problem of minimize energy cost for IDCs in deregulated electricity markets. In that work they focus on exploit the temporal diversity of electricity price and dynamically schedule workload to execute on IDC servers through an input queue. With the emergent multiple electricity markets in smart grid, how to reduce the energy cost for IDC processes has attracted a lot of attention. They didn't provide the guarantees for a service delay. Because of the energy problem in the cloud they may face the data loss and leakage problem. By providing the threshold value it reflects the unsuitable for an environment with dynamic workload and changeable workloads. The system should be able to robotically adjust its behavior depending on the workload patterns exhibited by the applications. So, need to auto-adjustment of the utilization threshold values. Energy consumption does not scale linearly with the work load. The system uses a significant amount of energy even when idle or frivolously loaded. It should be need to advance the efficient computing resource utilization and maximum minimization of energy consumption [13].

IV. PROPOSED SYSTEM

Our propose technique, which is based on threshold values of resource utilization in the cloud, temperature threshold values are consolidation for the consuming the energy for the users in the cloud. Resource utilization threshold values are calculated dynamically so only it will avoid the energy consumption. Therefore, the dynamic threshold is the most appropriate one for dynamic workloads. Using this it improves the resource utilization so balance the workload better. Temperature of CPU calculated using an endured thermal model which controls the heat of CPU. Using these thresholds identifies over loaded or heated hosts and under loaded or heated host. For this here we proposed the method called EMCO-IDC (Energy Management& Cost Optimization –IDC) to minimize energy consumption with balancing the workload of resources. So, it will helpful for consumed the more energy in both academic and industry. Our proposed consists of following techniques.

a. Load Balancing Migration Technique

Load balancing in cloud is one of the useful one to balance the load in web. By using a load balancing migration technique, it shares the load diagonally the physical servers in a datacenter with dynamic workloads. Dynamic workload in cloud data centre accomplishes by live migration [14, 15]. The Load balancing with energy management migration gives benefit like, increase resource utilizations, decreasing bottlenecks, enhancing

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scalability, avoiding over provisioning of resources etc.

b. Energy Management Migration Technique

Consuming energy is a most important factor in cloud. By sharing the data in web server's energy will loss due to transmission of data in all time for this problem here we use the technique called Energy Management Migration Technique. The energy consumption of data centre is mainly based on the utilization of the resources and their cooling systems [16, 17]. Any resources typically need up to 70 percentage of their maximum power consumption even at idle state. Hence the energy efficiency is calculated by Management of energy consumption is most important in the cloud therefore need to migration techniques.

$$\text{Energy Efficiency} = \frac{\text{Consumption Energy}}{\text{Total Energy}}$$

c. Cost Optimization Migration Technique

On the other hand, the operators need to guarantee that the cost optimization won't degrade the level of QoS (Quality-of-Service) provided to cloud service users. The ultimate goal of data center operators is to reduce the total operating cost, which depends on not only the consumed power but also the electricity price. Cost optimization technique which can be obtained by improved overall response time and data processing time with the help of improved algorithm. By using this it minimize the total electricity cost by optimizing the server provisioning [18].

V CONCLUSION

This paper investigates an emergent and important problem energy management in cloud. Today cloud computing is one of the important factor for accessing the resources in web that provide the resources through online which can also access in roaming. Roaming cloud resources are an important factor in today's world for the cloud users. IDC provide a data on web for accessing the data through web while in roaming also because of the cloud user needs.For the users request of data in web can face the problem of, Load balancing and energy consumption is one of the biggest issues in cloud IDC. In IDC Payment of a data center for energy and cooling may be larger than the overall investment in the computing system and also optimizing the cost also pay an important one. For solving this problem we proposed the EMCO-IDC (Energy Management& Cost Optimization –IDC). By using our technique it minimizing the energy and cost optimization total electricity cost for cloud data centers under IDC. Our technique will helpful for both academic and industry.

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