Novel Approach for Load Balancing in Cloud Computing

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ABSTRACT *The cloud is the architecture in which virtual machines, data centers, hosts and brokers are involved in the communication. The broker search most reliable virtual machine for the cloudlet execution. In the network uncertainty may happen due to which system get overloaded. In this research, work technique is proposed to increase fault tolerance of the system. The proposed improvement is based on the ACO algorithm which can select the best virtual machine on which cloudlet will be migrated. The performance of the proposed algorithm is testing on cloudSim in terms of execution time, energy consumption. The simulation results demonstrated that execution time and energy consumption of ACO is least as compared to TESA Algorithm. The proposed algorithm can be used for the load balancing in cloud computing.*

Keywords:*Load Balancing, Weight-based Algorithm, Virtual Machine Migration.*

Introduction

Cloud Computing is a computing paradigm. In which the systems are large in numbers that are connected in public and private networks. The reason behind using cloud computing is to provide an infrastructure for applications that should be dynamically scalable that has been used for storing data and files. The invention of cloud computing has reduces the cost too much extent along with it reduces the time required for application hosting, content storage and delivery [1]. In general three types of services are offer by cloud providers i.e. Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). The organization has to pay the cloud provider on the basis of usage of resources on computation basis all these reasons force a organization to attract towards cloud computing. In order to make ensure that organization will always be available to customers when required can be meet using the services of cloud computing. Cloud computing is a highly scalable and cost-effective infrastructure for running number of applications such as HPC, enterprise and Web applications [2]. However, there is one big critical issue in cloud computing which have been emerging due to its growing demand which have drastically increased the consumption of energy in data centers. The issue of high consumption not only increases the operation cost which reduces the profit of cloud providers but it also affects the environment as the high consumption of energy leads to high emission of carbon. Hence, energy-efficient solutions are required to minimize the impact of Cloud computing on the environment [3]. The objective of making cloud which is environment friendly can be achieved by the use of green cloud computing. The environment friendly structure which is efficient in terms of giving energy solutions and proves to be cost effective is the other need of cloud provider after being improvement in the current technology. The worldwide services and data have been provided to customer through green cloud computing which placed a number of datacenters in different locations [4]. To minimize the consumption of energy, achieving efficient processing and utilizing the computing infrastructure Green Cloud computing have been used by different researchers. The usage of energy will increases to large amount if the current cloud computing will not be able to fulfill the needs of increase in front end client devices that are interacting with data centers available in back end. There is a green lining provided by cloud computing even when there is higher energy utilization by the datacenters within these systems. The cloud providers have introduced numbers technologies and concepts in order to provide higher utilization and efficiency in comparison to the traditional computing systems [5]. Thus, due to the presence of highly energy efficient infrastructure and the minimization of IT infrastructure through multi-tenancy, there is less carbon emission involved within the cloud computing systems in comparison to other systems. Virtualization is the key driver technology utilized within the energy efficient clouds with the help of which the energy efficiency in cloud can be enhanced. Numerous organizations can leverage the economies with the help of huge numbers of organizations that have similar architectures. There are number of problems in green cloud computing. Out of all the problems the Virtual Machine (VM) is the most important to be consider [6]. By increasing the cloud resource utilization level with the use of virtualization technology cloud operation cost get reduce to much extent. But if the use of virtualization is not done properly in cloud data centers than the performance of cloud can be degrade too much extent. Virtual machine (VM) migration is a method that assists cloud service providers to efficiently manage cloud

resources while eliminating the need of human supervision. VM migration methodology migrate current-hosted workload from one server to another by either employing live or non-live migration pattern. In comparison to non-live migration, live migration does not suspend application services prior to VM migration process [7]. VM migration enables cloud operators to achieve various resource management goals, such as, green computing, load balancing, fault management, and real time server maintenance. There is a connection amongst the power being consumed by data centers and the processing power elements. The numbers of physical hosts' available on-position also plays an important role in computing this power consumption. Thus, the power being consumed by cloud data centers is minimized by including dynamic VMs. It is important to compute the number of working hours on work days and the number of requests generated for the cloud data center. The number of VMs that are to be allocated and made to run over the physical machines and hosts is also important to calculate [8]. There is no requirement of higher number of VMs in order to be allocated on the physical machines by the data center on days when traffic is less. Thus, the number of active hosts can be minimized easily through mobility and integration of VMs within the data center of the systems.

Genetic Algorithms are heuristic search approaches that are applicable to a wide range of optimization and learning problems. It works on the principles of biological evolution, these are simple to construct, and its implementation does not require a large amount of storage, making them a sufficient choice for an optimization problems. There are numerous advantages of genetic algorithms in comparison to the other already existing algorithms. Instead of involving only one individual value such as in calculus-based techniques, the genetic algorithms are generated from a population of the candidate solutions. The chances of identifying of local optimum instead of the [9] global optimum are minimized through this approach. Any kind of information that is not relevant to the values of solutions that might be possible is not needed in the genetic algorithm.

Literature Review

Meysam Masoudi, et.al, (2017), have investigated [10] the problem of power minimization for the user terminals by application offloading in multi-cell multi-user OFDMA mobile cloud computing networks where some practical constraints such as backhaul capacity limitation, interference level on each channel and maximum tolerable delay as user's quality of service is taken into account. Then further to solve the problem of optimization, the authors have proposed joint power allocation and decision making (J-PAD) algorithm which can make offloading decision and allocate power at the same time. Simulation results of this new proposed algorithm shows that by utilizing the J-PAD algorithm, in comparison with baselines, considerable power saving could be achieved e.g. about 30% for delays more than 100 ms.

Jagadeeswara Rao, et.al, (2017), have recommended that Cloud computing is a great platform using which corporate world is totally looking to reduce their expenditure on resources like software, platform tools and infrastructure. Cloud computing gives a cost effective infrastructure with high scalability and performance. The [11] cloud service providers provide the services through a large data centers. These data centers are maintained in the form of many clusters and each cluster is a group of several physical machines. These physical machines will be virtualized to create virtual machines and the clients access the services through these virtual machines. There will be increase in consumption of power and carbon emission by increase in demand on the data centre.

Mr. Nitin S. More, et.al, (2017), have recommended dealing with studying various techniques, models, and algorithms, for efficient green cloud computing by using virtualization techniques. There are numerous techniques which are related to power saving which can also help in enhancing the efficiency of the systems on the basis of sever and network involved. All such strategies are to be studied here in order to present a study on the existing methods [12]. New techniques with enhanced energy efficiency are being evolved which also include the QoS, SLA and VM consolidation in these systems. They didn't work on the ratio of computation and power which help in utilizing the resources in better way along with minimum consumption of energy.

Ehsan Arianyan, (2016), has proposed a consolidation as a novel technique for energy saving in Cloud data centers [13]. One of the major drawbacks of current studies on consolidation solution is that they focus only on one criterion and ignore other ones. Based on modified analytic hierarchy process (AHP) technique this study proposed a novel multi objective consolidation solution. The comparisons are made amongst various approaches and their results are evaluated in terms of simulation parameters. There is minimization in the energy consumption within the results achieved through proposed method. By implementing the proposed method in real cloud infrastructure management products, the experiments are conducted in this paper.

Federico Larumbe, et.al, (2016), have presented [14] in this paper that the response time of the systems is less for the users that are near to the VMs. This results in enhancing the QoS for the users due to distribution of VMs near to those users. A comprehensive optimization modeling system is provided for managing the applications which include such dynamic demand. An efficient search heuristic is developed here in order to resolve the issues. As per the results achieved by implementing the proposed technique, there is a reduction in the communication delay, the power consumption is saved and there is a minimization of the CO2 emissions as well. The meta-scheduler execution time is maintained here in the proposed approach which helps in providing an efficient execution time.

Chonglin Gu, et.al (2015), have recommended that for research utilization, virtual machine consolidation is the best solution found. Once the power consumption for each VM is known, more power can be saved here. There is a correlation between the resource features in order to provide modeling. A tree regression based method is proposed in this paper [15], which helps in computing the power being consumed by the VMs on similar hosts of the systems. The dataset will be partitioned as per the advantages of this method. Here, each dataset is an easy-modeling subset for the other. In various applications that run on VMs, the accuracy achieved by applying this proposed method is around 98% as per the experimental results. The accuracy of individual VMs is however not computed in this paper.

Research Methodology

In this research work, BFO algorithm is been applied to resolve node failure in the cloud network. In present algorithm there are number of nodes available. From these nodes, the candidate node will be chosen on the basis of failure rate and minimum execution time. Here Master node sets threshold value which includes two parameters amongst which one is failure rate and other is maximum execution time. The nodes which have equal to and less failure rate and minimum execution time are elected as candidate nodes by the master node. The node which has value equal to and less than this threshold value is selected as a candidate node. N1 has smaller value than threshold value so it will be a candidate node. N2 has one parameter less and other is higher so it will not be chosen as a candidate node. N3 has value equal to the threshold so, it will be selected as a candidate node 2. Again N4 has a greater value than threshold value and so it will not be selected as candidate node. After the selection, candidate node will start performing its tasks. We will also enter number of tasks in this scenario. Suppose, during execution of task one node moves from its location, and then failure occurs at that point. To overcome this problem a novel technique has been proposed which overcome the problem of failure due to mobility of the node. In the proposed algorithm, we have added a new parameter in the present algorithm that is master node time. Master node time is the result time to join the end users. It is for node collaboration. For this we have formulae which are as follows:

1. E-cost= maximum execution time + Time taken by the master node (master node time)

After that we will calculate profit of each node.

2. Profit of each node = E-cost+ Failure rate of each node
3. Weight of each node= No. of tasks + maximum execution time/Profit

The node which has the highest weight is chosen. Weight will be calculated according to the above mention formulae.

Pseudo Code

Begin
Step 1: Get list of all VMs working on all hosts.
Step 2: Initialize no migration is done.
Step 3: Get resource utilization, failure rate, and execution time of all machines.
Step 4: Built transition matrix for hosts and VMs.
Step 5: Loop will execute until all machines on over utilized hosts are migrated.
Step 5.1: Calculate the current utilization of each host for that particular VM that needs migration.
Step 5.2: Check creation history of the VM.
Step 5.3: Compare increase in utilization of selected hosts with other hosts.
Step 5.4: Select host for which increase in utilization is minimum End loop
Step 5.6: If maximum utilization exceeds upper utilization threshold go to step 5.1.
Step 6: Else choose that particular host for migration.
Step 7: return migration List
END

Experimental Results

The proposed work has been implemented in MATLAB and the results are analyzed in terms of the time consumed by the proposed and existing techniques as shown below.

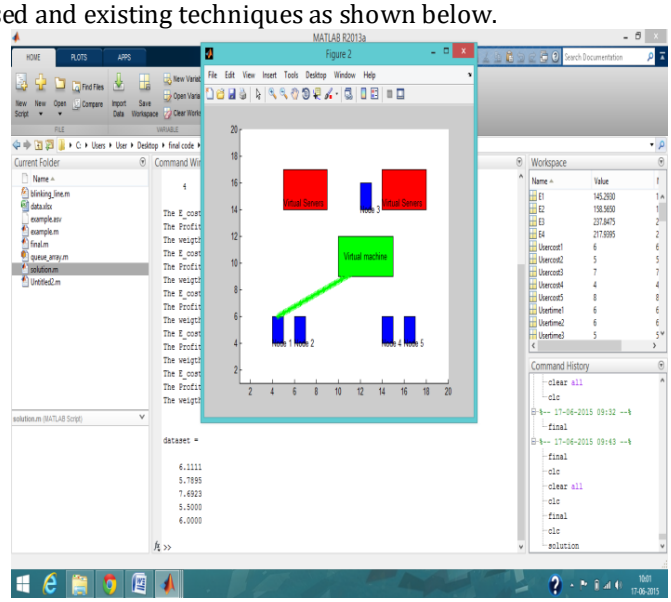

Fig 1: Default View

As illustrated in figure 1, the network is formed in which available nodes are deployed, virtual servers and virtual machines are deployed. The node is asking for the time taken by the virtual machine to complete the task. The interface is asking for the cost of the user 3 to executing task which is user wants to execute. The node is asking for the time of user 3 to execute for the task which is assigned by the user. The weight of the user is calculated for the task assigned to user 3. The task is allocated to nodes which has higher resources as set by the virtual machines. The node changes its position and fault is occurred in the network. The task is allocated to the node which has higher weight.

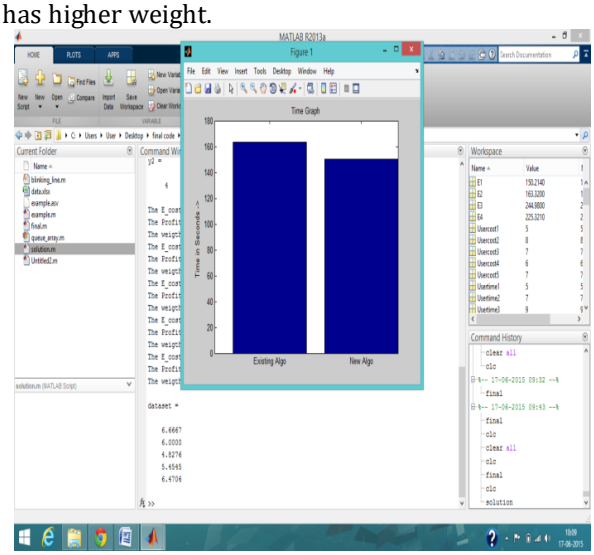

Fig 2: Time graph

As illustrated in figure 2, the time is used to calculate for the task execution. As shown in the figure, proposed algorithm uses less time for the task allocation process.

Conclusion

The virtual machine migration is the technique which is applied for migration of the cloudlets of one virtual machine to another. In this work, it is been concluded that due to virtual machine overloading execution time and space utilization is increased at steady rate. The ACO algorithm is applied in this work, through which the task of the virtual machine which gets overloaded will be migrated to another virtual machine for the efficient execution. The performance of proposed algorithm is tested in CloudSim and it is been analyzed that execution time and space utilization is reduced after virtual machine migration.

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