Novel Technique 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, Cloud Computing, Virtual Machine algorithm

1. INTRODUCTION
Cloud computing is a computing paradigm. In this 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 [2]. Cloud computing is a highly scalable and cost-effective infrastructure for running number of applications such as HPC, enterprise and Web applications. 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. 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. 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 [4]. In comparison to non-live migration, live migration does not suspend application services prior to VM migration process. 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 [5]. 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. There are two varieties of threshold required in order to control the allocation of VMs to various hosts. The overload on physical servers and transmitting the newly generated VMs to various hosts is managed by one threshold known as the upper threshold. Further, the hosts that utilize low-level and are the sources of wasting resources are managed with the help of lower threshold. There is a slight different amongst the green dynamic VM allocators and others. The hosts are controlled in workload that is closed to the upper threshold of the hosts within the systems that are utilized within these Green dynamic VM allocators [6]. The various in middle and low working servers are consolidated with the help of this action and rest of the servers are shut down. This whole process is referred to as green cloud VM management process.

2. LITERATURE REVIEW
Meysam Masoudi, et.al, (2017), have investigated [7] 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. By the use of D.C. approximation the mixed integer nonlinear problem is furthermore converted into a convex form. 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. Still there is need to improve power saving and have to reduce the delay even to more extent.

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 [8] 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 [9]. The network devices such as servers, CPU and switches are the ones which consume the highest power. In order to design modern algorithms there is still research being carried. 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. 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 three objectives have been considered in this such as energy consumption, SLA violation, and number of migrations in decision process. 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 [10].

Federico Larumbe, et.al, (2016), have presented [11] 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. The impact of maximization of energy consumption of cloud is very negative. It might also effect the global warming of the planet. The solution to this issue is provided by placing the VMs within the data centers which utilize the sources of green energy in the systems. 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 has 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 are numerous modeling methods proposed here in order to calculate the power consumption as it is not easily calculated in direct manner. A tree regression based method is proposed in this paper [12], 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.

3. RESEARCH METHODOLOGY

The green cloud computing is the energy efficient approach of cloud computing to store and process data from clouds. The fault occurrence is major issue of the green cloud computing which reduce its efficiency. In the base paper, meta-heuristic approach is used for the cloud assignment and execution. In this research, ACO algorithm will be applied for the task execution and task assignment. ACO algorithm is been implemented which migrate the task from one virtual machine to other in case of machine overloading. The ACO algorithm works in the three phases which are described below:-

1. Define Initial Population:- In the first phase, the initial population is given as input which is the execution time and failure rate of each machine. The initial population is used to select most reliable machine for the cloudlet execution.

2. Update pheromone:- In the second phase of the algorithm, the probability of failure of each machine is calculated on the basis of initial population. To calculate the probability the below equation applied

$$\rho_{i,j} = \frac{(\tau_{i,j}^{\alpha})(\eta_{i,j}^{\beta})}{\sum(\tau_{i,j}^{\alpha})(\eta_{i,j}^{\beta})}$$

3. Select best pheromone :- In the last phase the machine which has least probability of failure is selected as the best machine for the task migration. To select the best machine equation below is applied

$$\tau_{i,j} = (1-\rho)\tau_{i,j} + \Delta\tau_{i,j}$$

$$\Delta\tau_{i,j}^{\kappa} = \begin{cases} 1/L_k & \text{if ant k is the chances of failure} \\ 0 & \text{Otherwise} \end{cases}$$

3.1. Proposed Flowchart

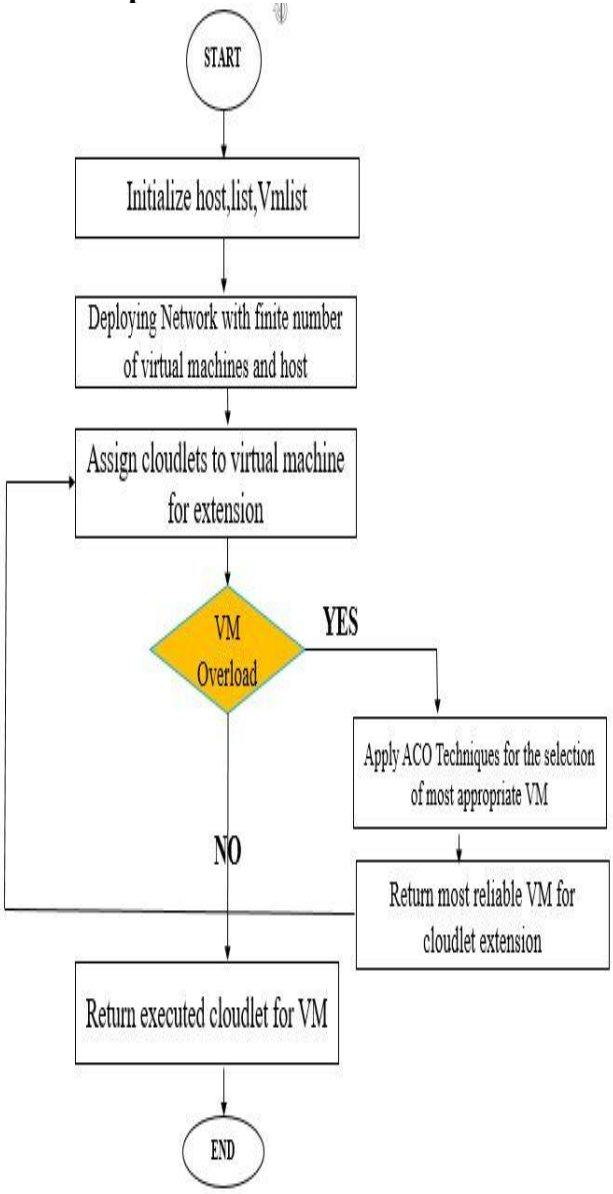

Fig 3.1: proposed flow chart

3.2. Experimental Results

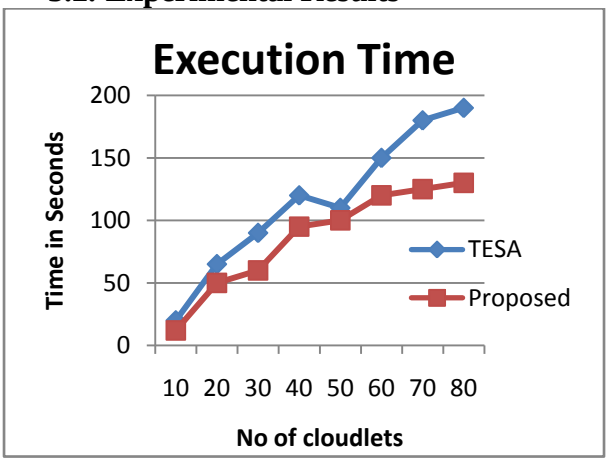

Fig 3.2: Execution Time

As shown in figure 2, the execution time of the proposed and existing algorithm is shown graphically. The graph shows the variation in the execution time correspond to different number of cloudlets

3.3. Energy consumption

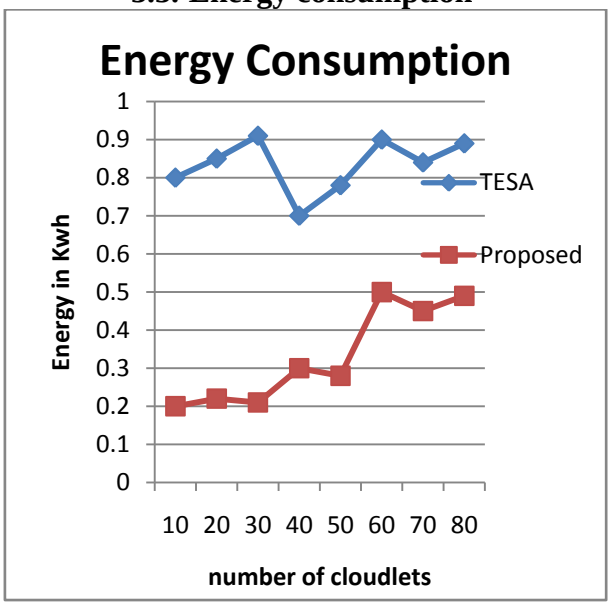

Fig 3.3: Energy Consumption

As shown in the figure 3, the energy consumption of proposed and existing (TESA) algorithm is compared graphically. To validate the results the cloudlets are varied in both algorithms

4. CONCLUSION

The virtual machine migration is the technique which is applied to migrate 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, which will migrate the task of the virtual machine which get overloaded 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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