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Resource Management Mechanism for Energy Awareness and Power Consumption in Cloud Computing System

Amith Agera[1], Jyothi S[2], Jyothi B[3]
[1]Dept of ISE ,Dr.AIT,Bangalore Karnataka,India
[2]Asst.professor Dept of ISE ,Dr.AIT,Bangalore Karnataka,India
[3]Asst.proffessorDept of ISE ,Dr.AIT,Bangalore Karnataka,India

Abstract – In recent years the cloud computing cycles and its storage facility has become a great service by providing the cloud farms to compute and store with the offers of various cloud service providers. As the cloud is gaining its popularity , its expansion has become one of the impact on energy consumption. The cost for cooling large scale data centers is expected to increase in future.For the purpose to overcome the power consumption in data centres an energy awared resource managing model is been proposed to manage load balancing and application scale in cloud.The load balancing and scaling algorithms exploit some of the most desirable features of server consolidation mechanisms. So an energy aware operation model is used for load balancing and application scaling.

I . INTRODUCTION

Today computing of cloud is an advanced growing technology that has struck the IT market. As one user gets the three types of services in the type of software, platform and Infrastructures.In modern computing environment there exists a big accommodation on platforms in computation and storage and are joined by Cloud Service Provider .

The large scale datacenters are the data handling and storage buildings which are maintained by every cloud based organizations are the basic blocks for infrastructure in cloud. The entire building is referred as a warehouse for large scale computers.The entire network in the warehouse contains the servers in the order of thousands and lakhs.

The cloud user can use the all available resources at any given part of time.The price or the user will be charged on the basis of the use of the resources.Hence the cloud exhibits the major property known as cloud elasticity.Since the number of cloud users are increasing the service providers have offered with variety of services.The users have increased drastically from the day of use of first cloud EC2 by Amazon Web Services to recent and popular icloud by Apple foundation. At current usage rate at peak more than 1 million requests are handled at every second.

The expeditious growth of cloud computation has resulted in a significant consumption of energy through the world.The cost incurring to cool the servers in data centres is raising daily.It is estimated that nearly 1.5 % of the power is consumed in U.S. is by data centres .So an estimation was put for making under use of idle servers which were contributing a major part of unnecessary CO_2.After that the result found was around 30% loss in energy was occurring by these idle servers.

The load balancing concept which implemented earlier is brought back in order to share the workload among the servers to increase the throughput avoiding overload of the systems.For energy reduction the load balance was made on different category of servers under a same group.The other servers are put in low energy state when not in use.

An approach to utilize the resources best way possible keeping mind the concept of energy consumption is to develop a model which will based on both energy aware and resource management called energy aware load balancing.The policy will cover the load balancing as well as power consumption dynamically based on the dynamic decisions to be taken to switch the server in a sleep state.In the discussion the main focus will be on server hardware and server software which makes possible to implement the energy aware load balancing on the cloud servers.It also depends on virtual machine monitor, operating system.The primary proposals in the document is energy effiency which is on power consumption, the newly implemented algoritm for load balancing and scaling which minimizes the number of servers at low energy state.For the implementation load balancing and scaling algoritms are implemented on clustered cloud systems,as working together of cloud servers will increase the effieciency, performance and reliability of the system.

II . RELATED WORK

The cloud based applications are gaining popularity in recent years, it has created a demand on cloud infrastructural performance.For providing greater performance there has been a setup of large scale data centres for the computing purpose that in turn consuming an extensive quantity of electric power.The power consumption on these data centres was increasing day by day drastically due to the rising number of requirements.

To make the cloud data centre an energy efficient system many algorithms and ideas have been proposed like Dyanamic Voltage and Frequency Scaling (DVFS), terminal servers and thin clients,virtualization of computer resources etc .One such approach was based on energy efficient resource management which could be implemented on virtual data center.The main idea behind the approach was to provider a greater fluidity to the resource provider based on the migration of VMs with the hosts.To minimize the power consumption idle nodes were put to off state.

The next approach primarily focused on private cloud infrastructure. For private cloud the entrerprise uses the cloud solely for its own purpose.From this perspective the main goal is on running the cloud at minimum cost . In such data centres the power management makes a challenging issue for the enterprise, since the power cost will be more than the investment cost which will be a loss to the enterprise.

To minimize the power consumption to some extent a proposal to migrate the data to cloud cells where the resources are provisioned dynamically. The concept of dynamic resource provisioning contributed mainly towards,

- a dynamic virtual machine provisioning manager on the basis of utililty which could balance both SLA issues as well as power consumption.
- To integrate the hosts by migration a dynamic VM placement manager was designed that could turn off the idle hosts to limit the use of energy.
- A two level resource management middleware framework that seperates application management and resource management.

Cloud computing has firmed its roots in information and communication Technolgies industry by its policy of pay as you go.Wheras the issue in data centres is regarding the power consumption rise in recent years. There is also an increasing level of CO_2 emmisions in the data centres.Based on the reports given by large cloud enterprises it was found that major power consuming is made by the resources used in computing.So this approach is mainly focused on managing the resources making sure that resources are used in efficient way by the applications.

One method to maximize resource utilization is bind the Virtual Machines.It makes the cloud dynamic in nature.It is then reallocated using live migration to the demanding resource to redce the number of active hosts.The idle hosts are changed to low working state to reduce power consumption.The main purpose of the approach is to reduce the power consumed by the servers and to maintain the Quality of Service (QoS) given to the system.

Even though the existing systems were quite useful in resource management and energy consumption there were certain drawbacks that had been observed like,

- On field experiments were mainly focussed on offered QoS , they were based on black box approach that could make a co-relate the obtained data to the internal resource management strategies implemented by system provider.
- Simulation does not allow to conduct comprehensive analyses of the system performance due to the great number of parameters that have to be investigated.

By observing the above scenarios a new approach which based on both energy aware and resource management load balancing mechanism.It mainly focuses on a new model of cloud servers different operating regime with different processing power and energy consumption.

It contributes towards a new algorithm that performs load balancing and application scaling to maximize the number of servers operating in the energy optimal regime and analysis and comparision of techniques for load balancing and application scaling using three different sized clusters and two average load profiles. The objective of the algorithms is to ensure that the largest possible number of active servers operate within the boundaries of their respective optimal operating regime. The actions implementing this policy are:

(a) Under low set of conditions the VMs has to be moved from the server and change the server to sleep state.

(b) The idle server is kept in sleep state and other servers are activated from sleep state as the load increase.

(c) Under high set of bad condition , the VMs are migrated from an overloaded server, a server at that high condition where application is said to increase the demand in the next reallocation cycles.

III . SYSTEM IMPLEMENTATION

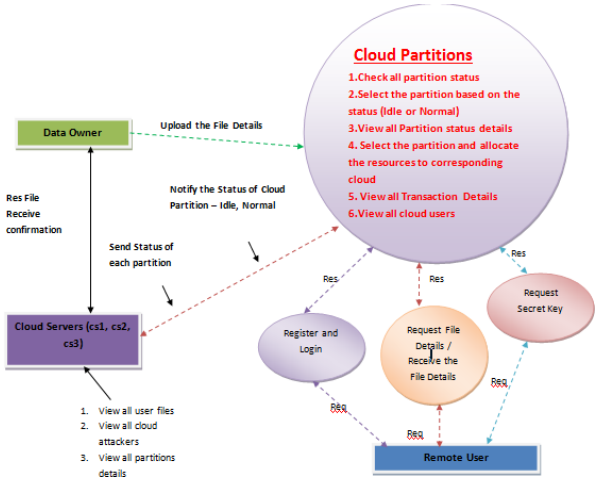

Fig 1 : System Model

A model has been set up to demonstrate the operations of energy aware policy by load balancing .The model consists of the modules which are mentioned below.The data owner module is the primary functionable module where the owner of the data in a particular cloud will be in action by uploading the files into the cloud server module.There is an authentication level which the data owner has to pass before accesing the cloud , provided by a unique login id and password which has to be entered in the login step.For a new user the register option will be provided that contains every details of the user like name, email, phone number and address.Once login is done the owner can access the features and the files which are stored in the server.

The other module is cloud server module which contains a ‘n’ number of servers to be which data has to be uploaded.The cloud server module consists of the the files that has to be viewed of the particular user.It also contains the list of attackers who tried to illegally accese into his cloud .It also contains the details the details on the partition of the remote cloud .The partition will be discussed in the next module.

The partition module is the main functional module which performs the major discussion of the paper that is regarding energy aware load balance.The partition

module consists of a load balancer that performs the balancing of data among the partitions of each cloud server.For a particular cloud server the load balancer will allocate the data to the partition based on idle and normal state of the servers.The energy of idle servers can be taken as zero ,when the energy of servers become zero the load balancer reallocates the data into the partitions based on their energies.

The end user in the model where the end user who wants the data from the cloud will get the access to retrieve the file in the cloud .The user will have a login ID and password for authentication .When user logins to the cloud he gets a secret key on using which he can get the files from the cloud.The secret key is encrypted by AES algorithm , it will be unique for a particular file . For unauthorized entry the secret key will not be generated automatically.In the case of entering the wrong secret key, the indivisual transaction and the user is placed in the attacker list.The indivisual is considered as an attacker.

IV . RESULTS

The analysis is performed by considering three cloud servers in the cloud environment.The partitions were also made on the basis of load that could be handled by the load balancer.In the experiment there are mainly three partitions that were made for easy analysis.In the experiment the main inputs are files uploaded which are allocated by the load balancer to indivisual cloud server.But for the result graph the output comparision was based on the energy of the servers.So based on the energy inputs following result graphs were obtained.

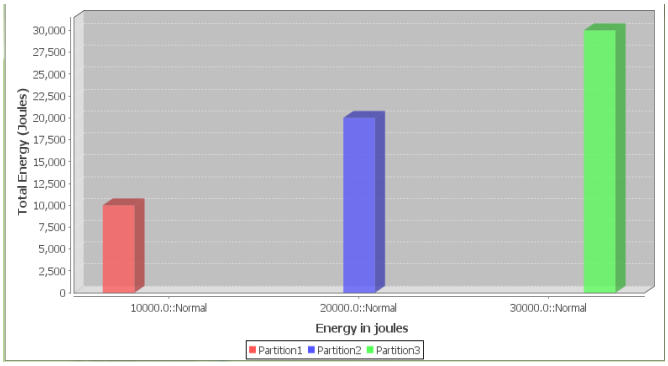

Fig 2: normal energy levels of the server partition

The first result graph was obtained with non zero energy levels that means all the cloud servers were given normal energy levels.In this case by default the idle energy is assumed to be zero for non zero energy of the server, it was considered to be in normal state and the file which is uploaded will be stored in partition one of first cloud server by default.

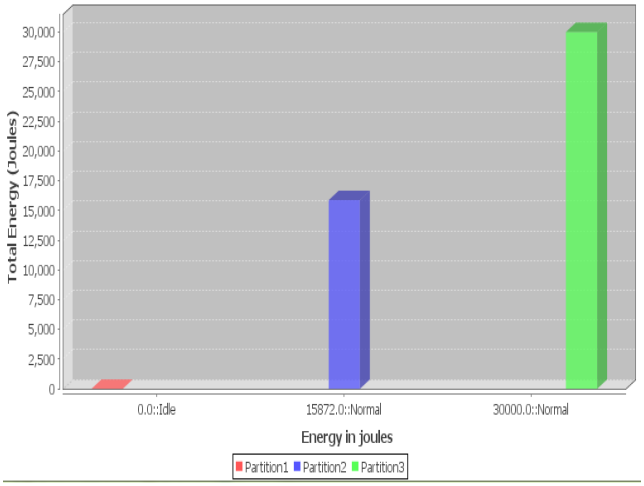

Fig 2: partition 1 is made to idle state

In next case the idle input of zero energy to the cloud server 1 is been assigned.When the load balancer detects the idle state of the server the file will be allocated to the next partition of the cloud server which has high energy levels.

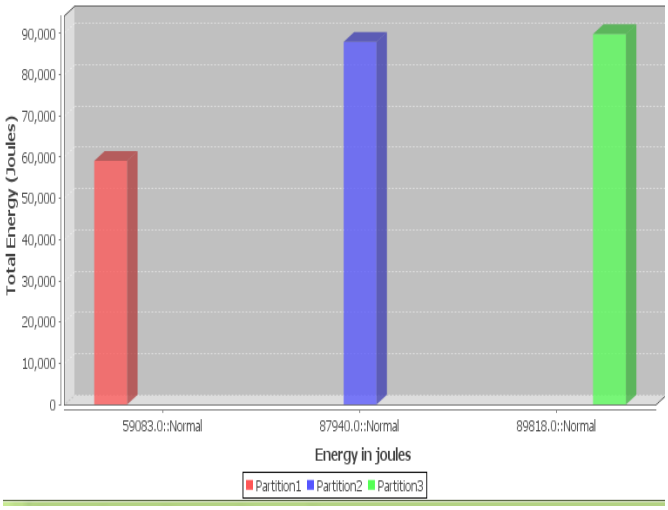

Fig 4: The reassigned energy of partition after idle state

In case 3 the inputs is given as idle that is zero for all the three partitions.In normal case it was expected to yield zero result whereas in this case the load balancer performs the automatic reassignment of energy to the servers when all are in idle state.So the above mentioned result obtained after assigning zero energy to all the partitions of the servers.

V . CONCLUSION

From the aspect of utilization of cloud by users and increase of data centres , the energy consumption has factor has become a considerable topic .It is expected in future to increase in a great manner.So it is important to deploy the new policies for less energy consumption also by considering the factor of SLA violations. A quantitative assessment of a streamlining calculation or a design upgrade is a somewhat many-sided and timeconsuming process For instance, the effect on the engineering is assessed by upgrades supporting Instruction or Data Parallelism on execution and corresponding energy utilization in few benchmarks are utilized.

Essentially, vitality effects gives a mindful calculation rely on upon the framework configuration and on the application and can't be communicated by a solitary numerical quality. Research on vitality mindful asset administration in largescale frameworks frequently utilize reproduction for a semi quantitative and, all the more regularly, a subjective assessment of advancement calculations or methodology.

The proposal chooses an optimal algorithm which could balance the workload increasing beyond the capacity of servers that could cause no SLA violations. For the energy aware efficiency the server with idle state to a sleep state by idealizing its energy as zero is considered, from where the server can be moved to sleep state.The future work is related to take an algorithm into account that can autoscale the load to the partitions based on the energy levels of other servers in the partition, so that there should be reassigning of the workload carried out by the load balancer on the basis of energy of servers.

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