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Hybridization of VM Based on Dynamic Threshold and DVFS in Cloud Computing

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ABSTRACT

Cloud computing is a new model that has transmuted the entire IT Industries by providing them accommodations whenever the clients require them. Cloud computing defines the utilization of incipient hardware and virtualization technologies to compose shared infrastructure that will enable the accommodations. Cloud providers have to ascertain the flexible delivery of user requirement yet have to take care of power consumption being done. It is basically cognate to the tradeoff between the performance and power consumption. Nowadays there is a quandary of reducing cost with deference to performance degradation. So optimization of performance and power consumption tradeoff is required. Cloud providers should facilitate the users in such a way that they do not violet the service level agreement yet contribute to minimize the cloud infrastructure energy consumption.

Keywords:- Cloud Computing, DVFS, Cloud, VM Consolidation, Power consumption.

I. INTRODUCTION

Cloud computing is a new paradigm which combines concepts, technologies and creates a platform for IT infrastructure and cost-effective business applications. The embracing of Cloud computing is increasing steadily for past few years in the technology market. By adopting cloud computing, IT (information technology) industries got benefited as cloud provides with less maintenance costs and infrastructure costs. Cloud computing; thus, may be defined as a multitenant environment that provides you with the resources and services abstracted from the underlying infrastructure. Services and resources are provided "on demand "and "at scale" in cloud environment. These terms used in definition could be elaborated further as:

- **Multitenant environment** - it's a type of environment that provides consumers with the resources from single implementation that saves the provider's costs.
- **On demand** - It means that resources can be provided when required, released when they are not required and estimated when only used
- **At scale** - services provides with the infinite resources so that they are able to meet all the requirements they have demanded.

In simple words, cloud computing is the endowment of computing resources through a reliable network. Enterprises have been trying to reduce the costs of computing and for that particular reason IT (information technology) started associating their IT operations and then on adapting virtualization technologies. In order to reduce more there is a better technology and it is Cloud computing. Cloud computing has taken enterprises at new level and have also provided them with faster deployment cycles, improved utilization, reduced administration, and thus reducing the cost as well.

- just a matter of making gestures but it will definitely amend a company's environmental identification.

II. LITERATURE SURVEY

Jayant Baliga, Robert W. A. Ayre, Kerry Hinton, and Rodney S. Tucker (2011) [1] have highlighted that the administration of power utilization in data centers has prompted various significant enhancements in energy efficiency .Cloud processing foundation is housed in data centers and has profited altogether from these advances. Point of reference investigations of energy utilization in cloud computing, have concentrated just on the energy consumed in the data center. Nonetheless, to acquire a

reasonable picture of the aggregate energy consumption of a cloud computing environment, and comprehend the potential part of cloud computing to give vitality resources, a more far reaching analysis is needed. They have introduced an outline of energy utilization in cloud computing and contrast this with energy consumption in conventional computing.

Hadi Goudarzi, Mohammad Ghasemazar, and Massoud Pedram(2013) [2] have considered a resource allocation quandary whose main objective is to minimize the total energy cost of cloud computing system and ascertain that they meet the designated client level SLAs in a problematic sense. Here SLA implicatively insinuates Service Level Agreement which designates constraints on performance and/or quality of the service that it receives from the system. Eventually these constraints result in rudimentary tradeoff between the total energy cost and client gratification in the system. They have presented an efficient heuristic algorithm predicated on convex optimization and dynamic programming to solve the aforesaid resource allocation quandary. They additionally have verbalized that virtualization technology can help in ameliorating the power efficiency of datacenters (server) consolidation, which enables the assignment of multiple virtual machines (VMs) to a single physical server.

Dzmitry Kliazovich ,Pascal Bouvry ,Samee Ullah Khan (2010) [4] have designed and proposed simulation environment for energy-aware cloud computing data centers. This simulator is designed in such a way that it will capture energy consumed by the data center components and packet-level communication patterns in realistic setups as well, along with the workload distribution. The result of the simulation received for two tier and three tier high speed data centers shows the usefulness of the simulator in utilizing the power management scheme such as voltage scaling, frequency scaling and dynamic shutdown which are applied to the computing and networking components.

Abbas Horri, Mohammad Sadegh Mozafari and Gholamhossein Dastghaibyfard (2014) [3] have proposed a novel QoS-aware VMs consolidation approach for cloud environments using CloudSim simulator. They have shown improved results in QoS metric and energy consumption and have also demonstrated tradeoff between energy consumption and QoS in the cloud environment. The simulation results justifies that the proposed algorithm significantly reduce number of VM migration, SLAV and total transmitted data as compare to current algorithm.

Yuan Tian , Chuang Lin and Keqin Li (2014) [6] have optimize the performance and power consumption tradeoff for multiple heterogeneous servers considering two problems (i)optimal job scheduling with fixed service rates (ii) joint optimal service speed scaling and job scheduling. They have proposed a mechanism called dynamic voltage and frequency scaling (DVFS) which can dynamically scale the server speed by reducing the processor voltage and frequency when the load is light. Without DVFS the service rate is a constant so they prove that with DVFS the feasible service rates are discrete and bounded and can save 50% power cost compared to the servers without DVFS.

- Verma et al. (2011) [9] have proposed and formulated the problem related to power aware dynamic placement of application in which they have used bin packing problem with the bin size and cost. Although they have worked upon live migration to move VMs to their new frame but did not work upon SLA. They divided the VM consolidation into three categories:

i) Static VM consolidation
ii) Semi static VM consolidation
iii) Dynamic VM consolidation

They have focused only on the first two categories. However Dynamic consolidation has not been taken in account.

Gregor von Laszewski, Lizhe Wang and Andrew J. Young (2012) [7] has concluded in their research work that DVFS is an effectual technique to reduce power dissipation of a processor. DVFS technique lowers the processor clock speed and supply voltage while intensive application phase and idle times. We can achieve large reduction in power consumption with modest performance loss. They also concluded from their observations that 1) their algorithm can reduce power consumption in a DVFS enabled cluster. 2) In case the number of PE is fixed, the power consumption increases as the no. of incoming virtual machines increases. 3) If the no. of virtual machines which are coming is fixed, the power consumption reduces as the no. of PEs increases.

III. PROBLEM FORMULATION

Increased demand in computational power has made the IT companies and the industries to shift to the cloud computing models which have been deployed by huge scale virtualized data centers. These data centers consumes ample amount of power. All the cloud providers must have to meet their user service requirement yet have to take care of the power being consumed. Basically it is a

tradeoff between performance and power consumption. This is how they are supporting green cloud computing. A novel VMs consolidation approach based on QoS awareness has been proposed which is based on the history of resources of virtual machines being utilized. Algorithm being used in this approach has following steps and has been implemented using the Cloud Sim Simulator.

i) Determine the overloaded host.

ii) Select some VMs from those overloaded hosts.

iii) Determining the under loaded host and Select all VMs from them to migrate.

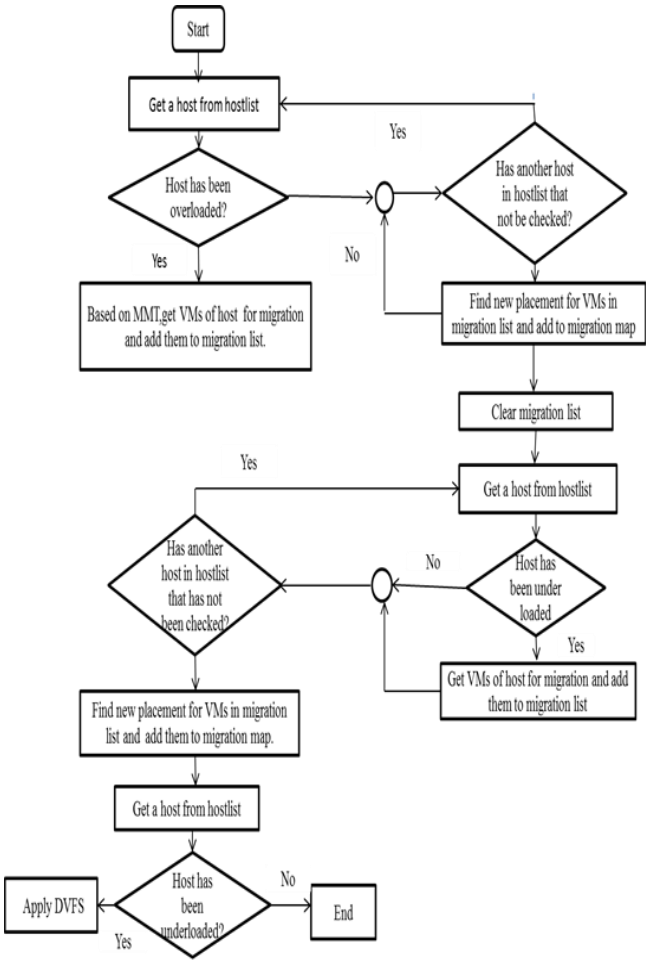
iv) Finding new placements for VMs.

This algorithm says that once we have found the under loaded hosts, all the VMs have to be migrated so that under loaded host can be kept either on sleep mode or can be shut down. That will reduce the energy consumption of that host.

Here we can see that idle server is also consuming this much power. Existing algorithms suggests migrate the host and then keep it in sleep mode. However, even if it is on sleep mode it will consume some amount of energy. To reduce that what we can do is, we can simply apply the technique of dynamic voltage and frequency scaling to reduces the power being consumed on the under loaded host. Then it may either be idle host or any other host which is under loaded.

However the problem which comes to be here in this algorithm is that even when the host is on sleep mode it will consume some percentage of power. And if we select the path to keep it on shut down mode, whenever any job is scheduled for this host it has to be turned on which will definitely take five times more power consumption than the normal turned on host takes. So to formulate this problem we have introduced the concept of DVFS which stands for dynamic voltage and frequency scaling. DVFS is used to dynamically scale the server speed by reducing the frequency and server speed when the load is light. Now days there are many processors like Intel's Speed-Step technology which has this mechanism to reduce power consumption. It has been proved that the power cost of the servers which do not have DVFS increases swiftly the moment any job arrives that too with high rate. However the power cost of the servers which have DVFS increase linearly that too with lower gradient. So it can be concluded that servers with DVFS can save at least 50% of the power consumed than with the servers without DVFS.

The advantage of using this technique in the existing algorithm is that when we keep the under loaded host on sleep mode after migrating all its VMs, and then we apply DVFS on those under loaded hosts, It will definitely reduce its power consumption since we know that even on the sleep mode the host consumes some amount of energy which we call static power. However this technique works on dynamic power consumption also.



IV. OBJECTIVES

- To implement VM consolidation.
- To optimize condition for DVFS and live migration.
- To study the various tradeoff between the performance and the power consumption in cloud computing.
- To analyse the way of reducing the static and dynamic power being consumed by the server.
- To analysis and compare the results of existing and new algorithm.

V. METHODOLOGY

The scenario is the pictorial representation of VM consolidation algorithm in which we have a host list as a

collection of different hosts. We apply the Local Regression method to check if the node is overloaded. If the node is overloaded we will migrate the VM based on MMT method i.e. maximum migration time and will add them to migration list, else we will check the host list again to confirm that we have not missed any other host to check. Once we have added the VMs of overloaded host to the migration list we will find the new placements for the VMs based on UMC method i.e. utilization and minimum correlation. Then we can clear the migration list. Same procedure has to be followed to check for the under loaded list based on VDT method i.e. VM based dynamic threshold. Once the under loaded hosts are determined and their VMs have migrated, idle host then will be kept on sleep mode. We again will get the host from the host list and check if it is under loaded. Then we will apply DVFS on those under loaded host to reduce the power consumption. This technique will reduce the static and dynamic power being consumed by the host.

Algorithm Proposed:

1) Determine which hosts are overloaded.
2) Select some VMs from those overloaded hosts.
3) Determine which hosts are under loaded and select all VMs from them for migration while keep it on sleep mode.
4) Now find the new placements for VMs.
5) Get a host from host list and again check if it is under loaded.
6) Apply DVFS(dynamic voltage and frequency scaling) on the under loaded host

The simulator which I am planning to use is Cloud Sim.

Cloud sim is one of the popular tool being used in cloud computing environment. 'Java' the object oriented language is being used in Cloud Sim. Since it has OOP features so according to user's requirement the modules of Cloud Sim can be extendible. This simulator poses the feature of modelling and creation of huge data centres, infinite numbers of virtual machines; it also introduces brokering policy and supports the important feature of cloud which we call pay as you go model. One of the significant features of this simulator is federated policy which is rare to be found in any other simulator. Feature of extendibility is making it even more popular. Nowadays researchers are using this simulator to evaluate the resource algorithm and energy efficient management of data centres.

VI. CONCLUSION

Tradeoff between power consumption and Service License Agreement violation (SLAV) has to be made by the cloud providers. Usage of energy efficient resource management policies will eventually escort to the increment of revenues. This all can be achieved by the consolidation of virtual machines and keeping the idle server on the sleep mode. Though if consolidation is done improperly, it will lead to SLAV. The proposed algorithm is efficient to reduce power consumption and SLAV and at the same time a technique called dynamic voltage and frequency scaling would be applied on the servers when the load is light. Eventually it will reduce the power consumption to few percent. As the servers with DVFS can save at least 50% power cost as compared to the servers without DVFS.

In future work, the research direction is the consideration of proposing an algorithm which reduces the power, enhances the performers while reducing the number of migration so that it may not violet service level agreement and provides the flexible service delivery.

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