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Effective Green Energy mechanism For Dynamic Consolidation of Virtual Machines

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Abstract — : **In this contemporary days, Power plays a vital role in large concerns of ingenuity date centers contains thousands of high-computing servers and providing outsourced business-critical Technology services. In this paper, we focused on reducing power consumption by the means of consolidating the resources dynamically. The idea is delivering computing infrastructure, in which cloud hosting are accomplished in suitable servers offered in datacenter, this system cannot promise QOS but attain maximum energy saving, thereby decreasing effective costs and reducing carbon emissions. In this proposed paper, dynamic allocation problem has been solved by employing shuffled frog leap algorithm. We proposed standard SFLA algorithm method to attain efficient and complete dynamic allocation of multiple resource VMs. The proposed scheme not only ensures QOS specified by SLA in attaining extreme power consumption and green computing goals. By VM migrations, consolidation of resources is attained and power saving mode for low-utilized or idle to accomplish power saving ensuring that SLA has been adhered to.**

Index Terms — **Cloud Computing, Virtualization, Dynamic Resource Allocation, Energy Efficiency.**

I. INTRODUCTION

Cloud computing provides on-demand provision for elastic Computing resources on a payable basis,modemized by the (ICT) Information and Communication Technology industry.Nowadays,most of the organization avoids high investment in their infrastructure and consequent costs in maintenance and upgrades by outsourcing the cloud usage in Computing technology.

Fast growing IT infrastructure leads to rapid growth in establishing significant data centers in the word. This leads to feasting of excess amount of energy for computing needs and thereby subsidizing high operating costs and carbon emanation. To solve the above issue, green cloud computing provides better resource allocation by using resource allocation and management algorithms which reduces the operational cost and in turn reduces the environmental impact with respect to the emission of carbon dioxide.

Cloud Providers can utilize Virtualization technique for generating numerous Virtual requests proceeding with solitary server through the improvement in consuming resources and growing the profit yield. Energy saving and utilization of resources has been done by dynamic consolidation of VMs by the means of Virtualization technology.

Fig 1 show SMART 2020: ICT growth rate rises rapidly in the upcoming future, thereby facilitating the less carbon

economy in the statistics age. Outsourcing IT service Business Concerns aims highly on reducing energy consumption in data centers. In ICT gas emission in data centers has been increased by 70% from 2007 - 2020.

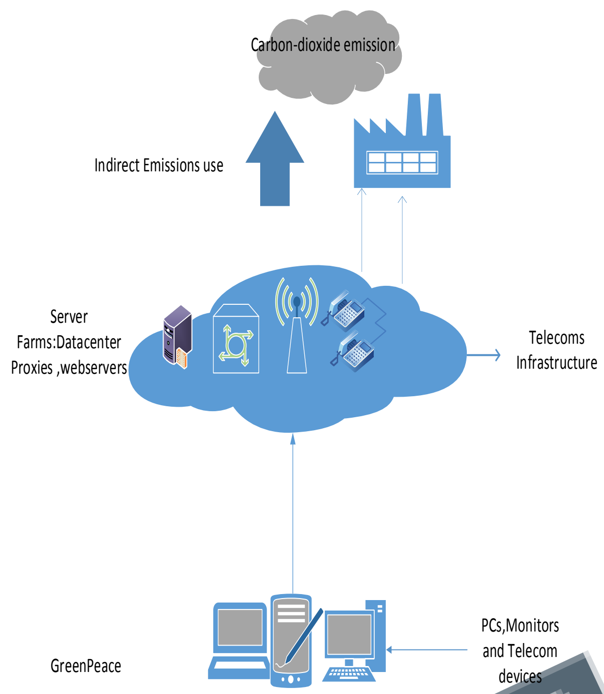


Fig 1 Green cloud Framework

Section II illustrates assessment in dynamic resource allocation of VMs when its overload and underutilized is explained .Section III is dedicated proposed work of overall architecture and each module of the system is explained in detail. Section IV is explained Implementation and performance analysis of results produced during simulation. Section V Conclusion and future work has been discussed.

I. RELATED WORKS

Kusic et al (2009) stated scheduling optimization difficulties in virtual hetergenous settings to reduce energy utilization and Violating the SLA. However the method is not implemented in Iaas cloud environment and large scale data centers. Verma, Dasgupta, Nayak, De, & Kothari, 2009, researchers implemented static structure, semi-static method and dynamic method to regular adjustment. However the SLA violation is not included in the proposed algorithm. The system performances degradation taken during different load states and SLAs cannot be guaranteed.

Beloglazov, Abawajy, and Buyya (2012) Solved the dynamic provisioning VMs, Though proposed system will not able to reach live association of VMs with the extreme Energy preservation. Resource scheduling strategy focuses on improvement of system performance in cloud datacenter and ensure SLAs. Abundant energy utilization of physical server decreases the constancy, frequently bringing down the VMs leads to unguaranteed QOS in dynamic environment.

Lee and Zomaya (2010) Stated energy managent approach in distributed cloud computing environment. They defined the enhanced relation between task handling time and drive feasting. Relative superiority worth of server is determined during the active condition and ignores the heterogeneous environment. Distribution of newly added VMs was considered.

Rusu, Ferreira, Scordino, and Watson (2006) Stated Energy managing approach in cluster system established on QOS. Strategy supports back-end and local management mechanism to obsolete the power by DVFS component and changes the server into its corresponding state. It involves offline calculation of server to switching to shut down or open the server. Live VM migration technology not defined for energy saving.

Berral et al. (2010) applied machine learning techniques to sort out energy consumption by dynamic consolidation of VM. Likewise, Rodero, Viswanathan, and Lee (2012) used Active Integration method for VM allocation and CPU dynamic Voltage scaling method to achieve energy saving in data center. But these method reflect HPC application with target constraints in certain occasions. Kramer, and Subramanian (2012) performed energy preservation techniques based on CPU active swapping condition and deployed the same for hetergenous cluster environment. Experiment supports better solution in a short time-period, but the techniques can't be applied for large-scale hetergenous cluster environment. Beloglazov, Abawajy, and Buyya (2012) solve the dynamic allocation of Vms.However algorithm cannot achieve the maximum energy conservation during dynamic allocation of VM.

At present, virtualization technology allow live migration of Virtual machines between physical nodes to achieve high-performance in computing application and to attains energy saving. If the desired requirement is less than the actual requirement, the VM switch over from one to other nodes by dynamic modification and grouping. The idle server switches to sleep/hibernate mode to save excess energy. Resource scheduling of virtual machines in cloud data center emphases on computing performance perfection and safeguards Service Level Agreement. Issues has been addressed and objectives is to sustain SLAs and save energy. First ,Extreme energy consumption decreases the solidity of server.Secondly,QOS not satisfied on frequent shutting down the server .Third, effective resource Administration is challenging to manage SLA and QOS in normal scheduling algorithm. However the above constraints has been resolved using effective resource consolidation achieving energy consumption and green computing as well as addressing QOS requirements .

II. PROPOSED WORK

Proposed dynamic consolidation of VMs by scheduling algorithm helps in decreasing energy consumption and exploiting resource efficiency without any violation on service level agreement (SLA) under QOS constraints. An inactive host has been automatically switched off to shutdown/low-power mode to exclude the fixed power and help in reducing the total energy consumption. Essential host has been re-activated to accompany new VMs. However dynamic VM scheduling in cloud is important, since in recent days several modern applications require high experience workloads causing resource allocation techniques. Hence performance degradation will be the impact of unimpeded VM consolidation .Whenever the application meets an increasing demand, resource usage appears. If the resources requirements are not met accordingly, the application will have an impact as increased response time, timeout/failures one method to overcome the problem by the means of efficient dynamic resource allocation of Virtual machines.

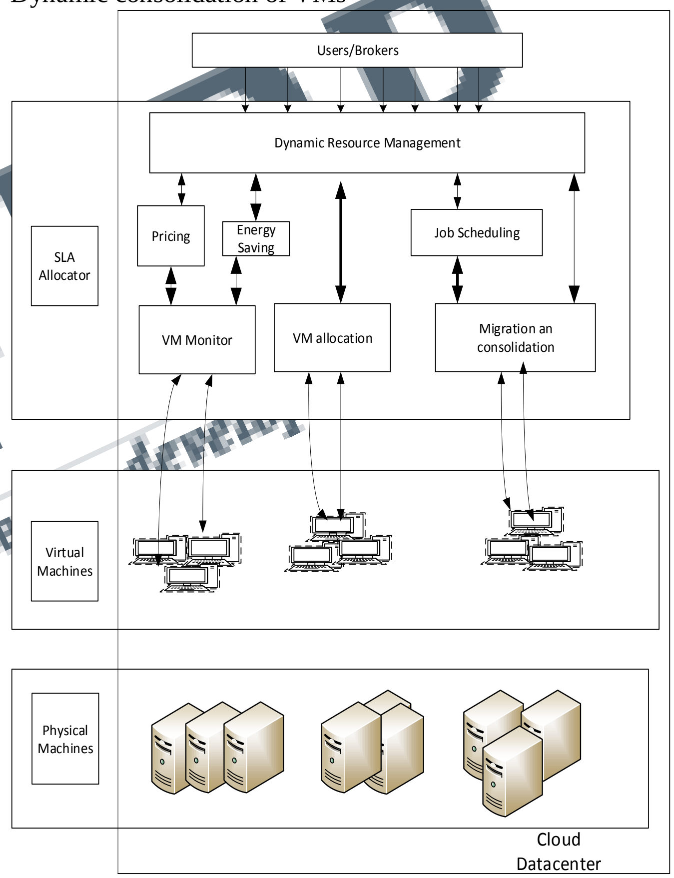
Energy saving can be done by the following methods

- swapping idle nodes to sleep /hibernate mode
- Live migration- The competency of transferring VMs among physical servers using dynamic allocation of resource scheduling.

a. Migrating VMs between hosts when it is underutilized by any of the host to diminish the number of live hosts.

b. Migrating VMs between hosts when it is over utilized by any of the host to avoid performance deprivation.

Figure 1 explains the architecture of proposed system. In this proposed work an effective dynamic resource administration scheduling context based on computing Infrastructure in cloud environment is explained. As illustrated in Fig. 1, the scheduling agenda distributes the functional resources to the suitable cloud based on the functional requirements and operative system of host with specified SLAs. To ensure response speed, the allocation of VM must be finalized rapidly. Dynamic consolidation of VMs



Established on two circumstances. First, the hosts that doesn't met SLAs, reduces the high threshold value of processor operation, and transfers some of the VMs to other hosts to decrease the load and to ensure the SLAs compliance. The scheduling contexts implement real-time observation on the physical (host) running conditions and to achieve dynamic consolidation of

VMs. Secondly ,if the hosts utilization load is under threshold value, transfers all VMS to another host and switching to hibernate/sleep state for energy saving. The above dynamic consolidation framework process should be implemented within assured period of time. For VMs that needs to be integrated is based on VM Scheduling algorithm, this problem has been solved using SFLA intelligent method. Unlike the heuristic algorithm or exact method SFLA algorithm evades ineffectiveness and extended calculation time. The SLAs compliance of Virtual machines should be guaranteed through the optimization sequence with minimum energy utilization. Frequent live VM migration affects service performance, that migration should not be too large.

A.Scheduling scheme meant for the lately functional VMs

Consumers spread on new instances (VMs) to the data center at frequent time. While attains SLAs, the applied instances in cloud data center instantly allocates VMs to the appropriate hosts. By means of the stated resource managing scheduling framework, the recently useful VMs that can meet SLA requirements are assigned to the host besides save energy. Provision is accomplished by the algorithm while pass through the host list one time, with the benefit of wild reaction.

B. Dynamic resource adjustment

VM provision is similarly in altering state. To reduce the number of migrations VMs are selected and consolidated within the target SLA .By the means of dynamic adjustment strategy migrations has been reduced during the selection and consolidation. The selection of hosts within SLA is determined from Eq.(1) by dynamically changing the higher threshold of processor exploitation: Selection of host can be determined by the equation.

$$\text{new\_upper\_th } \alpha \frac{R_{SLA}}{r_{SLA}} \text{ upper\_th} \qquad \text{Eq(1)}$$

R_{SLA} is the objective SLAs of the host, and r_{SLA} is the present SLAs of the host. Threshold value cannot be reduced or improved endlessly.QOS not satisfied, if upper threshold value increases. If threshold value get decreased, it could cause high energy consumption violating SLA. To determine the SLA violation of the existing host and to reduce the migration of host, we need to consider the sum of overall processor utilization of the remaining VM to be less than the fixed threshold after the migration of VMs, to meet the SLA. The specific scheduling strategy steps below,

vms=V$|V \subset hvs \sum_{h \in hvs} Utlz(h) - \sum_{v \in V} Utlz(v) < upperth, V \rightarrow min\} \rightarrow$ Eq(2)

VM to migrate By Violate SLA Host
{
Vms=NULL

AjustThreshold value by equation(1)
If (GetHostSLA>SLA
//By equation 2 ,choose VMS to be migrated//
VMs=getvmbyequation(2):
}
Return Vms:
}

To decrease the energy consumption, VMs under the worse threshold of processor utilization has been transferred. After these transferred, the host is switched to sleep/hibernate mode. Vms of the cloud with less utilization has been added to the migration list is described below,

VMs to migrate by lowload(host)
{
Vms=NULL;
If(Cpu utilization (host)<lowthreshold value
Vms=Getvmsfromhost(host):
Return Vms:
}

C. Energy utilization approximation of the host

Energy consumption mainly begun by the utilization of the CPU, cooling systems, memory disk, and hardware modules etc. in the enterprise data center.Morever, the idle host's accounts for more than 70 % of full-load task dynamism consumption. Live migration also considered for high energy consumption. Live migration techniques allows wild and elastic reset of VMs, VM memory and VM itself not copied during migration .The live migration period of VMs is identical to the proportion of memory size and network bandwidth. Even, running services and performance get affected during the live migration. Energy consumption within period of time can defined in Eq. (3) Emax(C) is the energy utilization of occupied load Utlz(C) is the normal utilization rate of the host processor within period of time, v is the group of VM migrations within the period of time window, and T(i) is the relocation time of VM i.

E(C)=0.7E_{max} (h)+0.3Utlz(c)E_{max} $(h) +$
0.1E_{max} $\sum_{i \in V} T(i)$→Eq(3)

D.VM scheduling process

Active resource consolidation is implemented within convinced time window. To define the best scheduling structure, all the VMs to be assigned in the overall scope by the means of SFLA. The projected algorithm clearly indicates the constraints on QOS and also clarifies that the performance of VMs can be adjusted by changing the parameters.

Cloud providers with efficient energy resource managing framework, done by using dynamic VM consolidation switching idle nodes to sleep/hibernate mode thereby maximize their Return On Investment (ROI).However consolidation dynamically might lead to a violation of SLAs negotiated with customers. In proposed work, we have analyzed intelligent algorithm and based on this analysis we have proposed that shuffled frog leap algorithm reduces the limit of SLA violations and the number of VM Migration.

Combinatorial optimization problems has been solved by using intelligent algorithm called shuffled frog-leap algorithm (SFLA). SFLA, simple heuristic search technique determines the optimal resource management. It consists of narrowed search and global exchange, cooperating effective population of frogs segregated into altered memeplexes. It explains mimic behavior of frogs searching for food laid on stones randomly locating the same on pond. SFLA, has the combination and advantages of memetic algorithm and particle swarm optimization(social behavior).In cultural evolution virtual frogs acts as hosts. It performs independent local search and global exploration are sporadically lumbered and restructured into new memplexes. Virtual frogs are generated randomly with the updated information and replaced the same in the population. Various test cases with dissimilar problems and universal optimization problems has been sorted by using this algorithm. The efficient algorithm has been applied to groundwater calibration issue and water distribution method to get the fitness value. SFLA, be an effective and efficient algorithm in solving optimal and combinatorial issues while compared to other algorithm.

Calculation can be done by the equation describe below,

$D_{i,w}(k) = Wrc(X_b - X_{i,w}(K))$→Eq(4)

W-Leap vision weight
c-leapvision factor
r-random number
Xi,w(k) –Frog worst fitness position value
Xi,-Best position of group in the group.
Di,w(k) – Worst frog moving distance value.

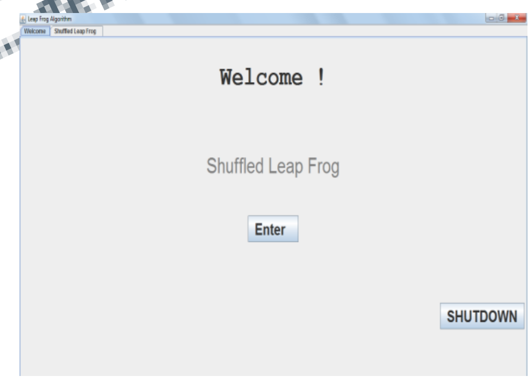
III. EXPERIMENTAL RESULTS

CloudSim, an open-source simulation tool that allows cloud developers to test the performance and experimental analysis. The simulation parameters are given below.

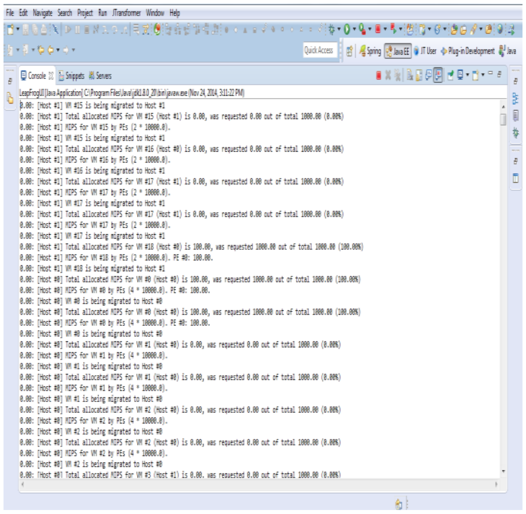
The simulation cloud Platform was configured with 20 VMs with 40 cloudlets using dynamic allocation method of MSFL.

I.

II.

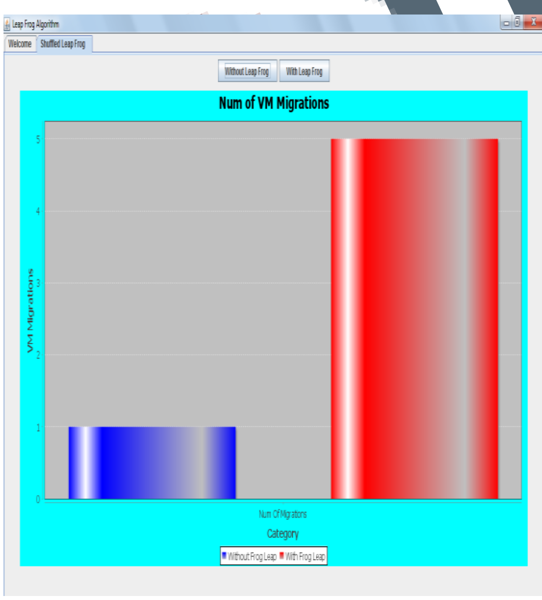


III.
IV.
V.
VI. Fig 3 Main Menu of Shuffled frog Leap
VII.
VIII. Fig3 illustrated the main menu screen of simulation.
IX.
X.



XI.
XII.
XIII. Fig 4 Migration of VMs

The Fig 4 shows the results of the comparison between the execution time between the Power aware and Non-Power[1] aware based method we got high throughput while it also meet the deadline constraint of proposed work.



XIV. Fig 5.Migration of VMs using intelligent algorithm

XV.

The Fig 5 shows the results of the comparison between intelligent algorithm in which power saving has been done by allocating the resources dynamcically.Migration time has been reduced and minimum energy consumption has been preserved with the intelligent algorithm when compared other algorithms.

CONCLUSION AND FUTURE WORK

Dynamic allocation of virtual machines in cloud computing is the challenging job .In this we have presented the SFLA algorithm for resource allocation that makes energy efficient. The proposed architecture decreases the energy consumption during migration and when host is overloaded or under loaded. And also the factors to be considered for cost /deadline are involved to allocate the VM. The proposed algorithm allocates VM according to the scheduling framework and defined parameters like processor, RAM etc. The efficiency depends on the processor utilization. When the utilization is low, the processor has great potential to save energy by slowing down the task execution.

Today,cloud has been progressed in the computing world for hosting thousands of applications in various fieilds like science,medical,business,social networking ,media etc.Efficient Management of energy in IAAS service model provides scalable,flexible services with low energy consumption ,reduced operational cost and decrease of carbon emissions. In future, this work can be extended for dynamic resource allocation using ACL/VLan isolation in large heterogeneous data center using SDN.

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