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Potential Load-Based Virtualization Selection on Overloaded Cloud Hosts

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ABSTRACT

Consolidation of virtual machines (VMs) is used to improve physical resource utilization and reduce data centre power consumption. Selection of VMs on heavy load hosts and moving them to low load hosts, this process is known as V_m Migration, and it has a significant impact on the energy concept of many data centers and the SLA. With V_m selection, CPU utilization and resource satisfaction are the primary factors to consider. V_m navel placement and selection was based on the expected future load, in order to reduce the migration frequency. The proposed method's better performance of Vm Placement time SLA and energy usage will be evaluated on Clouds.

Keywords: VM migrations, energy consumption, dynamic consolidation and cloud computing

1. INTRODUCTION

The rising energy costs of data centres are a major factor in the rapid expansion of internet-based large-scale services, which are served by a plethora of locally hosted data centres. 45 percent of the cost is due to energy usage by resources such as storage, main memory, and processors. Many cloud providers must cut their operating costs [1] by reducing power consumption in order to be competitive in today's cloud industry.

Today, virtualization has replaced physical machines, cloud providers offer services based on particular criteria, such as SLA (service level agreement), resource usage[2] (storage, main RAM and CPU) has increased, VM migrations have dropped in number and so on. Virtualization is a technique that allows a single physical machine to run many virtual machines (VMs), reducing the amount of energy consumed, increasing the utilisation of resources, and making resources available on-demand. However, the cost of VM migration is a drawback[25].

VM migrations that aren't absolutely necessary add energy consumption and other administration costs, such as virtual machine reconfiguration and online migration, as well as the creation and destruction of VMs[3]. In order to save energy, we reduce the frequency of VM migrations. Dynamic aggregation of Virtual Machines is one way to reduce energy consumption by reallocating VMs often to cut down on the number of active hosts which use live migration. However, the performance of the programme should be taken into account when putting these virtual machines. As a result of the limited resources, we are unable to run all virtual machines on a single server, which reduces performance. Because of the restricted number of resources available, SLAs between cloud providers and users are violated if resources are used above their maximum capacity. As a result, in order to maintain SLA agreements, CPU utilisation should be limited so that hosts are not overloaded[23][24].

Another option is to turn off some of the most frequently used PMs [4]. Google's data centre report[4] shows that just 30 percent of its servers are being used at any given time. A small number of active hosts are left after the migration to PM, each of which is overburdened due to the shutdown of inactive hosts when resource consumption falls below a certain level. Consolidating virtual machines is difficult because of the unpredictable nature of their workloads. To make the process easier, the fundamental challenge has been broken down into sub problems. (a) Detecting overloaded servers; (b)

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Locating servers with load below the threshold; (c) Choosing migratable VM criteria; and (d) Choosing acceptable destination servers to install these VMs[22].

2. RELATED WORK

The rapid rise of cloud services necessitates that cloud service providers look for cost-effective and efficient ways to attract and retain clients by offering services at a cheaper price. To keep the lowest price, they must lower additional costs, such as the energy consumption of physical hosts, while maintaining SLA agreements between the user and the supplier. The researcher therefore does not concentrate on procedures that are energy efficient.

To lower the number of active hosts at any one time, Dong and his colleagues devised a policy that incorporates the quadratic assignment and the Bin Packing Problem, both of which are combinatorial optimization NP Hard problems[1].[5] Nathuji et al. created an architecture with energy management to view data. A virtual machine (VM) consolidation is carried out by two components of the architecture: global and local resource management. Although limited look head control (LLC) attempts to approach the problem of VM consolidation as a sequential optimised one in [6], it fails to preserve SLA[21].

Dynamic VM placement via bin packing was suggested in [7] by Verma and colleagues. However, this does not meet the SLA standards, and as a result, SLA violations occur because workloads are unpredictable and unstable. Although Srikantaiah et al.[8] take into account disc optimization and CPU utilisation, their solution is only acceptable for a particular application and is not suitable for universal contexts. Consequently, the compromise between performances in terms of energy consumption is efficiently achieved[20].

In[9] authors proposed dynamic ways to determine whether the host was high-loaded or not by keeping 85 percent as the threshold of CPU utilisation, static threshold first studied in [10].There is a variable threshold for CPU utilisation in [11]. Recently, they've been hard at work. Using a strategy provided by Beloglazov et al. [11][12], which is based on VM consolidation and resource allocation that is energy-conscious, these methods assess CPU utilisation at regular intervals and set a threshold value. However, if the threshold is exceeded, the virtual machine will be moved. However, this is not suited for virtual environments with fixed threshold levels, because it cannot adequately reflect the complexity and volatility of workloads. Consequently, the static threshold for their job has been replaced by a dynamic variable in [13]. Modified Best Fit Decrease (MBFD) [11] selects the VM with the lowest energy consumption.

To determine the best possible VM for a given Host, four new policies were presented in [13]. It saves energy, but it violates the SLA during VM Migration, and the pace at which it violates the SLA is increasing over time[19]. They established a new VM distribution and selection mechanism that considers the rate of SLA violation in order to resolve these issues. [14] authors developed a new VM selection approach that selects a VM with the highest positive correlation coefficient to the total number of VMs on the host. Choosing the proper Host and migrating to a migratable VM is critical in [15][16] in order to replace the Migrated VM[17][18].

3. VM SELECTION AND PLACEMENT POLICY

If the host's load exceeds the specified load, the machine on that server must be relocated to another host with a lower load. choice of virtualization and migration to different hosts lower resource usage like estimation procedure so that reduced power conception and increased resource utilisation. For Vm selection, there are four policies to choose from. Minimum Migration Time, Minimum Correlation and Random Selection are all examples of these requirements. Select the least time-consuming VMs in MMT, MU Select the least amount of CPU time and the highest possible correlation between Vm and MC

In order to avoid the migration of virtual machines, we suggest a noval Vm selection policy based on anticipated loads. First, find the S_{dev} of CPU utilization of all virtual machines on a loaded host, then find the expected loads of all virtual machines on that host, then select candidates for migration based on the host cpu utilization distinction with Sdev non zero, then select all virtual machines from the candidate set until it reduces its host load to below the threshold value, it is shown in Algorithm 1 called Potential Load based Vm Selection..

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Algorithm 1: Potential Vm Decision Dynamic load (MP)

Input: Host Overwhelmed (H)

Output : *Vm_list* migratory routes that are prioritized

Vm_list={v_1,v_2….v_n} // List Virtual machine on H
VM_CPU_list= VM_CPU_Asc(Vm_List) // Asc Order Vm based on they CPU utilization
Sdev=Standated_devation(VM_CPU)
F_Vm_Load_list{ fv_1,fv_2….fv_n} =future_loads(Vm_list)
// Estimated feature load in ascending order
For each v in VM_CPU_list
If((v-sdev)>0)
Add_Migration_list(v)
For each v in F_Vm_Load_list
If v in Migration_list&& Load(H-SV)<THRESHOLD
v add Select_Vm_list(SV)

Our new method places new hosts based on their future loads in order to stabilise hosts that provide long-term uptime under threshold loads and minimise migrations, which is different from the existing PABFD ("power aware best fit decreasing") method for Vm placement.

Algorithm 2: Potential Vm Positioning Depends on Traffic

Input: Virtual machine list (Vm_List),host_list(H)

Output : Host list{$H_i(V_j)$….. $H_m(V_n)$}

$H_i(V_j)$: V_j migrate on H_i

F_load_list=Estimate future loads of(H)
For each h in H
CSH(h)=$\sum_{i=0}^{n}(Util_{reg(i)})$
Add CSH(h) to CSH_list
For i=0 to n
H_load_list(i)= F_load_list$_i$*+ CSH(*h_i*)*
For each v in Vm_list
Find iH_load_list(i)-Reg(v)< threshold
Store $H_i(v)$

These hosts pick the Vm's placement based on the entire maximum Vm load and prospective loads, and less than the criterion.

4. EXPERIMENT SETUP

Experimenting with real-time cloud data centre technologies is costly and time consuming. The performance of various VM placement and selection strategies will be examined using Cloud Sim 3.0 simulation. In order to model and simulate cloud computing systems, the Melbourne UNIV created Cloud sim, which is used to model and simulate physical hosts, data centres, and virtual machines. Many assessment factors, including as energy usage, SLA violation %, and the total number of virtual machine migrations, are required to evaluate the algorithm's performance.

Using MCC's standard VM allocation policy, which sends each VM to the host with the lowest energy consumption rise following the allocation, we compare various VM selection policies. Experiments conducted by these researchers reveal that the proposed VM technique is the best option (MP). The outcomes of any host overloading algorithm are compared to each other. Utilization and VM migration count are two of the four VM collecting policies. Figure 1 shows the results. According to the findings, these are the results: With our suggested algorithm, MP, the similarities among IR and MAD methods are crucial.

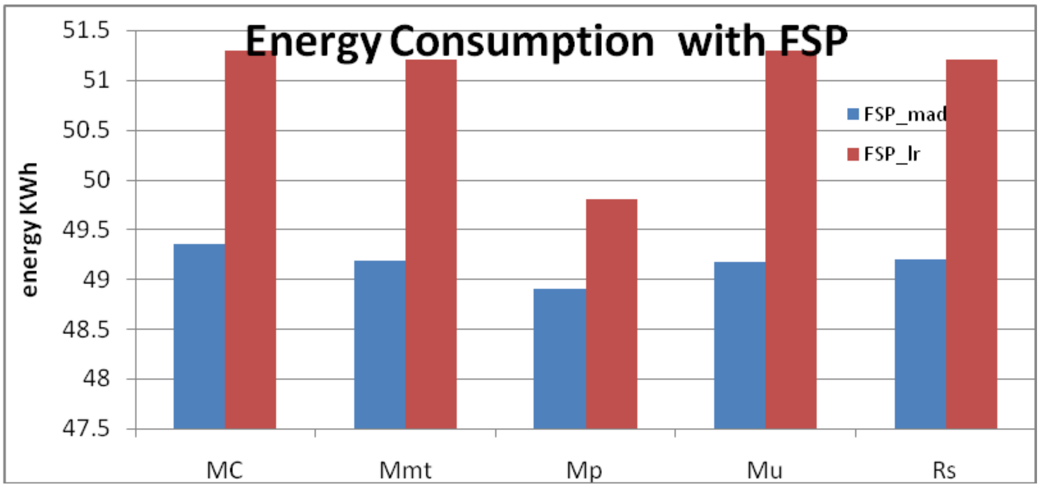

Figure 1 Energy consumption with FSP

A distinction between MCC and FSP VM farms is seen in Figures 2-3. The MP should not be included in set of four basic VM policies. It is possible to minimize the impact of MP. There are two estimates of what will happen. Viewpoint: energy consumption and the number of migrations to the virtual machine a. We may conclude that the FSP algorithm outperforms the MCC algorithm in terms of energy consumption regardless of the algorithm combination. In addition, the number of VM migrations is roughly 63% lower with the FSP algorithm than with the MCC Approach.

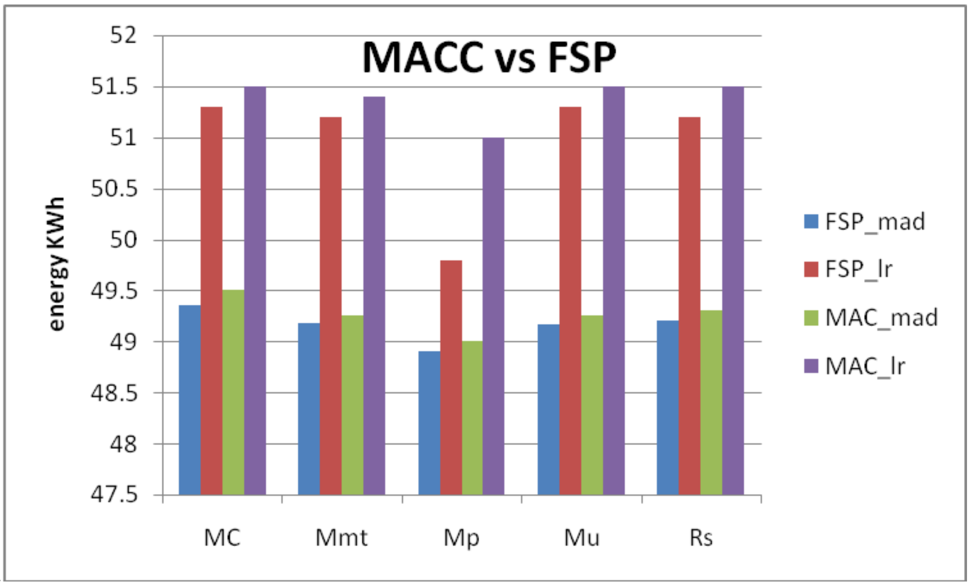

Figure 2 Energy consumption with FSP Vs MACC

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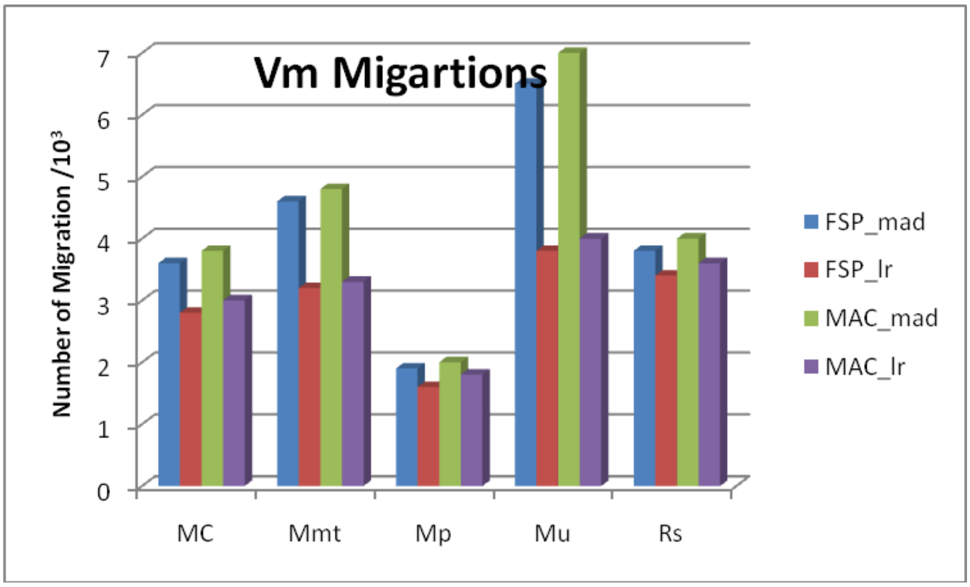

Figure 3 Number of Migrations with FSP Vs MACC

5. CONCLUSION

Energy consumption must be minimized if SLA violations in virtual data centre's are not eliminated. As part of our effort to reduce energy consumption, migration times, and SLA breaches, we are developing VM selection policy (MP). A VM positioning method (FSP) is also proposed to choose the host machine with the smallest future traffic similarities to the migrated virtual machine. The article's three recommendations for VM gathering and VM placement policy are supported by the results of experiments. Every time an algorithm is successfully mixed, the value of the parameter changes. The strategies we've developed in the simulated reality have yielded better results, but we have no idea what they will do in a real cloud infrastructure. A real-world cloud system, such as Open Stack, will be added in the future to test the suggested policies.

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