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Low Power Consumption on Cloud Data Centres Using HSA Algorithm

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ABSTRACT

The rapid development of knowledge and communication has created a new processing style called cloud computing. One of the key issues facing cloud infrastructure providers is minimizing costs and maximizing profitability. Power management in cloud centres is very important to achieve this. Energy consumption can be reduced by releasing inactive nodes or by reducing the migration of virtual machines. The second is one of the challenges of choosing the virtual machine deployment method to migrate to the right node. This article proposes an approach to reduce electricity consumption in cloud centres. This approach adapts Harmony's search algorithm to move virtual machines. Positioning is done by sorting nodes and virtual machines according to their priorities in descending order. Priority is calculated based on the workload. The proposed procedure is envisaged. The evaluation results show less virtual machine migration, greater efficiency and lower energy consumption.

Keywords : Cloud Computing, Virtual Machine, Harmony's Search Algorithm

I. INTRODUCTION

Cloud computing is a network-based model that offers a new paradigm for the delivery, use and delivery of services (including infrastructure, software and platform) over the internet. With the growth of information technology, IT activities need to be performed anytime, anywhere. In addition, people want to perform heavy computer tasks without expensive hardware and software. Cloud computing is the latest technology to meet these needs. It provides flexible infrastructure for a variety of computers and storage services that use virtual machines (VMs) [1,2].As a cloud service provider, it is important to achieve maximum profitability by minimizing operating costs and ensuring the SLA. Therefore, power management in cloud centres has become very important to achieve this. The increase in the cloud and the growing demand for the structure have significantly increased energy consumption in data centres. A typical data center with thousands of racks requires ten megawatts of power, which will be more than the data center operating costs [2]. From 1990 to cloud computing, a model based on computer networks offers a new paradigm for the delivery, use and delivery of services (including infrastructure, software and platform) over the Internet. With the growth of information technology, IT activities need to be performed anytime, anywhere. In addition, people want to perform heavy computer tasks without expensive hardware and software. Cloud computing is the latest technology to meet these needs. It provides flexible infrastructure for a variety of computers and storage services that use virtual machines (VMs) [1,2]. As a cloud service provider, it is important to achieve maximum profitability by minimizing operating costs and ensuring SLA. Therefore, power management in cloud centres has become very important to achieve this. The increase in the cloud and the growing demand for the structure have significantly increased energy consumption in data centres. A typical data center with thousands of racks requires ten megawatts of power, which will be more than the data center operating costs [2]. From 1990 to current energy consumption has doubled and is expected to increase by 2.2% every year until 2040 [9]. This high energy consumption can increase costs and reduce profits for cloud service providers. As temperature rises, equipment life violations, decreased reliability, QoS and SLA violations occur [6].

Due to the growing popularity of cloud computing users and the increased global awareness of the sustainable use of resources, researchers have designed a cloud with the implications of green cloud computing to reduce both the consumption of energy and carbon dioxide emissions. Various techniques are introduced in this regard. One is the consolidation of virtual machines. With this technique, the workload of multiple physical machines is placed on one physical machine and the machine is shut down or put to sleep with a low workload. There are two challenges to consolidate: 1- Choosing the best physical machine to host the World Cup in, to have as many physical resources as possible and to lose as little as possible. 2- If the allocation is not performed correctly, the number of VMs in migration will increase, and since the migration uses the CPU and bandwidth to transfer memory pages from the source to the target node, it will therefore increase energy.

The aim of this study is to select the best physical machine to redistribute a VM and reduce the migration of VMs to reduce energy consumption. To accomplish this, the Harmony Finding Algorithm (HSA) has been modified to select the appropriate physical redistribution machine and the algorithm used in [34] will be used to reduce the number of migrations. The rest of this document is as follows: Chapter 2 examines work related to the subject. Section 3 describes HSA. Section 4 presents and evaluates our approach. Section 5 analyzes the results of the simulation. Chapter 6 discusses the conclusions and recommendations for future work.

II. LITERATURE SURVEY

Nathuji et al. [35] studied the problem of large-scale resource management in their virtual data centres and this was the first time a power management technique has been used in a virtual system. In addition, hardware scalability and VM consolidation are used together and the authors apply power management techniques, namely software source scalability. The aim of this approach is to exploit the virtual guest machine, and the authors share resource management in local and global politics. At the local level, the power management of invited virtual machines in all physical machines and global policy responsible for managing multiple virtual machines, to free the host at low load and save energy, consolidates the virtual machine . The results show that the proposed approach leads to effective coordination of VM and energy management policies and reduces energy consumption by 34%.Verma et al. [36] proposed an energy-sensitive framework for heterogeneous virtual environments. They use hardware techniques such as dynamic voltage and frequency scaling (DVFS) and virtualisation to manage energy. Assign a global manager to assign new virtual machines and assign virtual migrating machines. Migration costs are calculated based on the size of the virtual machine. The authors also compare different algorithms to solve the problem of flow optimization. They solved a number of problems with the packaged packaging approach, including variable-size containers and packaging costs using the first fit reduction algorithm (FFD). In FFD, trays are first sorted in descending order, then checked from the larger tray to see if they fit in one package. The results show that this framework saved about 25% of the energy. VM reallocation was performed using a reduction of the optimal energy matching algorithm (PABFD) on a set of physically heterogeneous machines to minimize power consumption in virtualized data centres.

Study by Boyya and Belaglazov [2,3,4,5]. According to the PABFD, firstly, virtual machines are sorted in descending order according to the efficiency of their processors. The sorting machine is then assigned to the node with the smallest increase in power after allocation.

Fu and Zhou [13] studied the research work of the cloud team [3,5] to propose new approaches to reduce energy consumption. They use a strategy to improve the selection of VMs based on CPU usage and assign VMs to migrate to a host using the minimum correlation coefficient (MCC) method. This means that if the virtual migration machine is detected, the host performance will be reduced and disrupt the virtual machine function on that host.

Murtazaev and Oh [34] integrate nodes in green cloud computing using the VM migration algorithm. Because migration is expensive for cloud providers, the author's second goal is to minimize the amount of migration. Their approach goes beyond heuristic conditioning algorithms, as the first corresponding drop algorithm.

Suresh Kumar and Aramudhan [29] plan tasks using the Harmony and Bat Search algorithm. The objective functions considered in a HSA select a solution and compare it to the worst available solution in compromised memory. This approach will be used as software as a work planning service (SaaS) service.Hoang et al. [18] provided a framework for HSA-based wireless real-time (WSN) sensor networks and optimized the power distribution on this network by reducing the distance between its nodes. The Harmony Search Optimizer algorithm runs in a reasonable amount of time for real-time operations to extend the life of WSNs and apply them to real-world projects such as room temperature and fire detection. The results show that the proposed protocol extends the life cycle of WSNs.

2.1. Analysis of HSA Algorithm

HSA was first introduced in [28]. This has been applied to many optimization problems, such as water distribution networks, underground water modelling and energy savings. HSA is faster and more converging than particle optimized (PSO) and genetic algorithms and has lower equations and parameters [15, 16]. To explain HSA, the process of producing music is examined by trained musicians. Harmony as a coordinate in music is the name of a complementary note or complementary frequency that is added to the main melody to transfer emotions and make music more beautiful and pleasant [28].

Think of orchestra musicians. Each of these is a variable in HSA. The coherence that results in the orchestra is the answer vector or solution, and the number of repetitions in the HSA is a musician's ongoing training. Because all the coherence in the orchestra after production must be considered in terms of aesthetics, all solutions in the HSA must be evaluated by the fitness function. In each iteration, musicians try to improve one another, where the harmony of aesthetics is better than the previous one [28].

To maintain the best previous consistency in HSA, memory syntax is used. This memory is implemented as a matrix where each row is completed and entries are the variables considered for each solution. The number of columns in the matrix shows the dimensions of the solution [28]. The number of rows in the matrix is called the amount of harmonic memory (HMS). The last column of the matrix is considered to store each fitness function (solution). The view of the harmonization memory matrix (HM) is shown in Figure 1, where N is the dimension of the solution

$$HM = \left[\begin{array}{cccc|c} x_1^1 & x_2^1 & \cdots & x_N^1 & f(x^1) \\ x_1^2 & x_2^2 & & x_N^2 & f(x^2) \\ \vdots & \vdots & \vdots & \vdots & \\ x_1^{HMS} & x_2^{HMS} & & x_N^{HMS} & f(x^{HMS}) \end{array}\right]$$

Fig1 HMM

What is important in this algorithm is to find the best solution among the existing solutions and choose the appropriate value for the parameters to improve the efficiency and performance of this approach. The purpose of parameter settings is to choose the optimal value for the parameter, so that the optimal algorithm performance (optimal performance). These values might have a significant impact on the efficiency and effectiveness of the algorithm [16].

III. Proposed Algorithm Low power Consumption at Cloud data Centres:

This paper aims at energy efficiency in infrastructure as a service level (IaaS). The main technique used to improve resource efficiency in data centres is virtualization. The proposed approach reduces VM migration and energy consumption, using dynamic placement of VM migrations. There are four stages to this approach:

1. Sort hosts in descending order according to their workload

2. VMs are selected from low-loaded hosts for migration and are sorted in descending order according to their ranking on the migration list. It should be noted that there is a possibility of migration if all VMs can migrate from the considered host. If this is not possible for one VM, there is no migration from that host.

3. Add a VM from the migration list to the target host taking into account the 70% threshold (e.g., a VM is assigned to a host that adds a VM and host rank less than the 70% threshold).

4. Turn off the low load host: This research focuses on VM placement. VM placement can be considered a box packaging problem, because the trash can is the host and the package is a VM. Because bin packaging is a difficult NP problem [34], heuristic methods are used to solve it. For VM consolidation and migration, the algorithm proposed in [34] is used and for calculating the ranking, the formula introduced in [34] is applied. The best possible solution is to use a migration VM using a modified HSA. In this study, the fitness function is defined as follows: VM will be given to the host if the VM and host rank increment is below the threshold (70%). A mock code of the proposed approach to increase VM allocation to hosts is shown in Figure 2.

```
Migration Map optimiseVm Allocation ( Vm List , Host List )
{
   Omit all vms in vm list that in migration or recently assign
    Find all under load hosts ( the model introduced in[34])
    Select vm in under load host to be migrated(the model introduced in[34])
    Placement this vm (Call Hs for this vm)
    For (all under load host) until possible (capacity not full,Ts : 70%)
    Migrate all vms from first host of queue
    Omit host from first of queue power it off
}
```

Fig2: Pseudo code

4. Simulation Analysis:

The Cloud Sim simulator is used to evaluate the proposed approach. The data set is obtained per. Case for ten working days from the total trial period [5] per Case from 800 hosts and infrastructure level (Table 1). To provide the virtual migrant machine with a suitable host, HSA is implemented in the simulator. The algorithms and formulas in [34] can be used.

Workload Date	Number of VMs
03/03/2011	1052
06/03/2011	898
09/03/2011	1061
22/03/2011	1516
25/03/2011	1078
03/04/2011	1463
09/04/2011	1358
11/04/2011	1233
12/04/2011	1054
20/04/2011	1033

Table 1: Workload Table

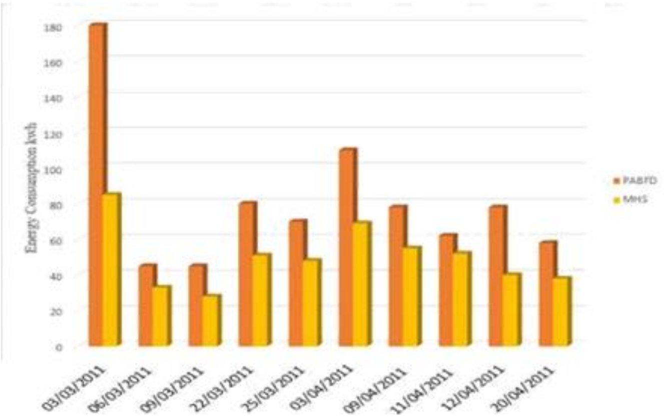

Fig:3 Comparison of Existing system and proposed LPC for Data cloud center

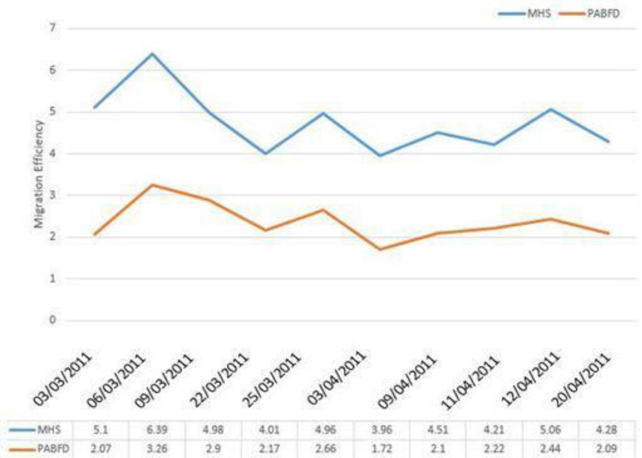

Fig:4 Migration Efficiency

The simulation results show that the number of virtual machine migration is reduced by 46% because, based on the consolidation and migration models used, the host with the lowest workload and the lowest number of virtual machines is selected. for arrest. Compared to PABFD, the proposed approach reduces the number of active hosts by 40% and saves energy consumption by 25%.

IV. Conclusion and future work

A cloud infrastructure approach to energy efficiency was proposed in this article. Low-load hosts are detected and stopped and their virtual machines transferred to the relevant hosts. Sufficient HSA for exchange. The Cloud Sim simulator was used for the evaluation. The results of the comparative evaluation show that the proposed approach exceeds in terms of migration numbers, number of active hosts, energy efficiency and migration efficiency parameters. HSA has a simple structure and can be combined with other meta inheritances to solve the problem of this study. For example, the Ant Colony algorithm can be used to start Harmony memory, or HSA can be combined with the PSO algorithm to reduce energy consumption. To minimize cloud response times, use the parallel version of HSA.

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