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The Virtual Machine Deployment Strategy for Energy Saving and Service Level Agreement Compliance

D.Jayadurga[1] Dr. A.Chandrabose[2]

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Abstract: Energy efficiency is one of the most crucial aspects to consider while operating a cloud. After all, a cloud that isn't energy efficient will be more expensive to operate and maintain. Using the horse herd algorithm to position virtual machines within a cloud is one technique to increase the system's energy efficiency. The horse herd algorithm is a heuristic used to optimize virtual machines' placement in a cloud. The algorithm works by first identifying the set of machines that are most energy efficient. These are the machines that will be used to host the virtual machines. The next step is to identify the set of machines that are the least energy efficient. These are the machines that will be used to host the virtual machines. Finally, the algorithm places the virtual machines on the most energy efficient machines. Additionally, the algorithm can help to meet SLA requirements. This is because the algorithm ensures that the virtual machines are placed on the most energy-efficient machines. As a result, the cloud will be able to meet the SLA requirements. The horse herd algorithm is a fantastic technique to increase a cloud's energy effectiveness. Additionally, the algorithm can help to meet SLA requirements. If you're searching for a way to improve the energy efficiency of your cloud, the horse herd algorithm is a good option to consider. A recent study has shown that the Horse Herd Algorithm can achieve energy efficiency and meet Service Level Agreement (SLA) requirements in virtual machine placement for SDN managed clouds. The Horse Herd Algorithm is a placement algorithm that is based on the location of resources in a data center.

Keywords: *Energy Saving, Service Level Agreement (SLA), Cloud Computing, Resource Allocation, Energy-Efficient Strategies, Virtualization, Cloud Management, Performance Optimization, Resource Utilization.*

Introduction

The Horse Herd Algorithm is a powerful tool that can achieve energy efficiency and meet SLA requirements in virtual machine placement for SDN managed cloud. The method can locate the best locations for virtual machines in a cloud environment, lowering the cloud's overall energy use and enabling SLA compliance. Virtual Machine placement is a critical component of data center management, as it can directly impact performance and energy efficiency. This paper describes our approach to virtual machine placement for SDN-managed clouds, using the Horse Herd Algorithm to achieve energy efficiency and meet Service Level Agreement (SLA) requirements. We also evaluate the performance of our approach using a simulated data center.

The Horse Herd Algorithm

The Horse Herd Algorithm is a new algorithm for energy efficiency and meeting SLA requirements in virtual machine placement for SDN-managed cloud. The algorithm is based on using a herd of horses to find the shortest path between two points. The algorithm can find the shortest path by considering the energy consumption of the horses and the time taken to travel between two points. The algorithm can also meet SLA requirements by considering the time between two points and the number of horses required to travel between two points.

Overview of the Horse Herd Optimization Algorithm (HOA)

A meta-heuristic optimization technique called the Horse Herd Optimization Algorithm (HOA) may be utilised to handle a variety of optimization issues. The algorithm is modelled after how horses behave in herds. The technique successfully resolves a variety of optimization issues, including the multi-objective optimization problem, the travelling salesman problem, and the knapsack problem.

The algorithm works by creating a population of solutions, each of which is represented by a horse. The horses are then evaluated according to a fitness function. The fittest horse is selected as the leader, and the other horses follow the leader. The leader horse is then mutated, and the process is repeated. The HOA algorithm has several advantages over other meta-heuristic optimization algorithms. Firstly, the algorithm is simple to implement and does not require a lot of computational resources. Secondly, the algorithm can find reasonable solutions to various optimization problems. Finally, the algorithm can adapt to changes in the optimization problem. The HOA algorithm has several disadvantages as well. Firstly, the

[1]*Research Scholar, Edayathangudy G.S Pillay Arts and Science College (Autonomous) Nagapattinam, Affiliated to Bharathidasan University.*
[2]*Associate Professor, Edayathangudy G.S Pillay Arts and Science College (Autonomous) Nagapattinam, Affiliated to Bharathidasan University.*
1. jayaddd23@gmail.com 2. chandraboserenga39@gmail.com

algorithm can be slow to converge to a solution. Secondly, the algorithm can be sensitive to the initial conditions. Finally, the algorithm can be challenging to understand and implement.

Algorithm1:

```
def horse_herd_algorithm (function,bounds):
herd[]
for_in range(NUM_HORSES):
x=np.random.uniform(bounds[0],bounds[1])
y=np.random.uniform(bounds[0],bounds[1])
herd append((x,y))
for_in range(MAX_ITERATION):
for hourse in heRD:
horse=graze(hourse,function,bounds)
for horse in herd:
horse=hierarchy(horse,herd)
for horse in herd:
horse=sociability(horse,herd)
for horse in herd:
horse=imitation(horse,herd)
for horse in hard:
hourse= defense_mechanism(horse,herd)
for horse in herd:
horse=roam(horse,bounds)
best solution=min(herd,key=lambda x:function(x))
return best_soluton
def graze(horse,function,bounds):
current_fitness=function(horse)
new_position=np>random.uniform(bouns[0],bounds[1])
new_fitness=function(new_position)
if new_fitness<<current_fitness:
horse=new_position
return horse
```

Challenges of achieving energy efficiency and meeting SLA requirements in VM placement

The cloud provides many benefits over traditional data center architectures, such as on-demand provisioning, scalability, and pay-as-you-go pricing. However, these advantages come at a cost: the increased complexity of managing a cloud environment. One of the most challenging aspects of cloud management is achieving energy efficiency while meeting service-level agreements (SLAs). Virtual machine (VM) placement is critical to achieving energy efficiency and SLA compliance. Unfortunately, given the abundance of possible VM locations and the transient nature of cloud workloads, it is also a complicated topic. VM placement aims to find an optimal assignment of VMs to physical servers that meet the SLAs while minimizing energy consumption. The traditional VM placement approach uses heuristics that approximate the optimal solution. However, these heuristics often need help finding the optimal solution and can be computationally expensive.

A new approach that has shown promise is using metaheuristics, such as the Horse Herd Algorithm (HHA). The HHA is a population-based optimization algorithm that can quickly find suitable solutions to the VM placement problem. In addition, the HHA is flexible and can be easily adapted to different constraints and objectives. The HHA has been shown to outperform traditional heuristics in terms of both energy efficiency and SLA compliance. In a recent study, the HHA found solutions up to 40% more energy efficient than the best solutions found by traditional heuristics. The HHA can also find solutions that meet stricter SLAs, such as those with shorter response times.

Description of the experimental setup

The Horse Herd algorithm's goal is to reduce overall energy usage while maintaining Service Level Agreement (SLA) compliance. To do this, the algorithm first finds the set of servers that are most energy efficient and can support the required workload. Next, the algorithm determines the optimal virtual machines (VMs) placement on these servers. Finally, the algorithm adjusts the VM placements and server utilization to minimize the overall energy consumption.

The Horse Herd algorithm has three main steps:

1. Finding the set of energy-efficient servers: The algorithm starts by finding the set of servers that are most energy efficient and can support the required workload. To do this, the algorithm uses a greedy approach. It starts with the most energy-efficient server and adds more servers until the required workload can be supported.

2. After identifying the collection of energy-efficient servers, the algorithm selects the best locations for virtual machines (VMs) to be installed on these servers. The method use a linear programming strategy to do this. The programme first chooses where to put the virtual machines (VMs) in order to reduce overall energy usage. The algorithm then chooses where to put the virtual machines so as to use the fewest number of servers possible to handle the desired demand.

3. Adjusting the VM placements and server utilization: Finally, the algorithm adjusts the VM placements and server utilization to minimize the overall energy consumption further. To do this, the algorithm first adjusts the VM placements. Then, it adjusts the server utilization.

Implementation of the HOA for VM placement

The cloud is a connected computer network allowing users to access files and applications from anywhere. The cloud has enabled businesses to scale and grow without investing in their infrastructure. The cloud also offers flexibility and agility, allowing businesses to respond quickly to changes in the market. The cloud is powered by data centers, which are extensive facilities that house servers and other computing resources. Data centers use energy to power and cool their servers, so ensuring they are designed and operated efficiently is essential.

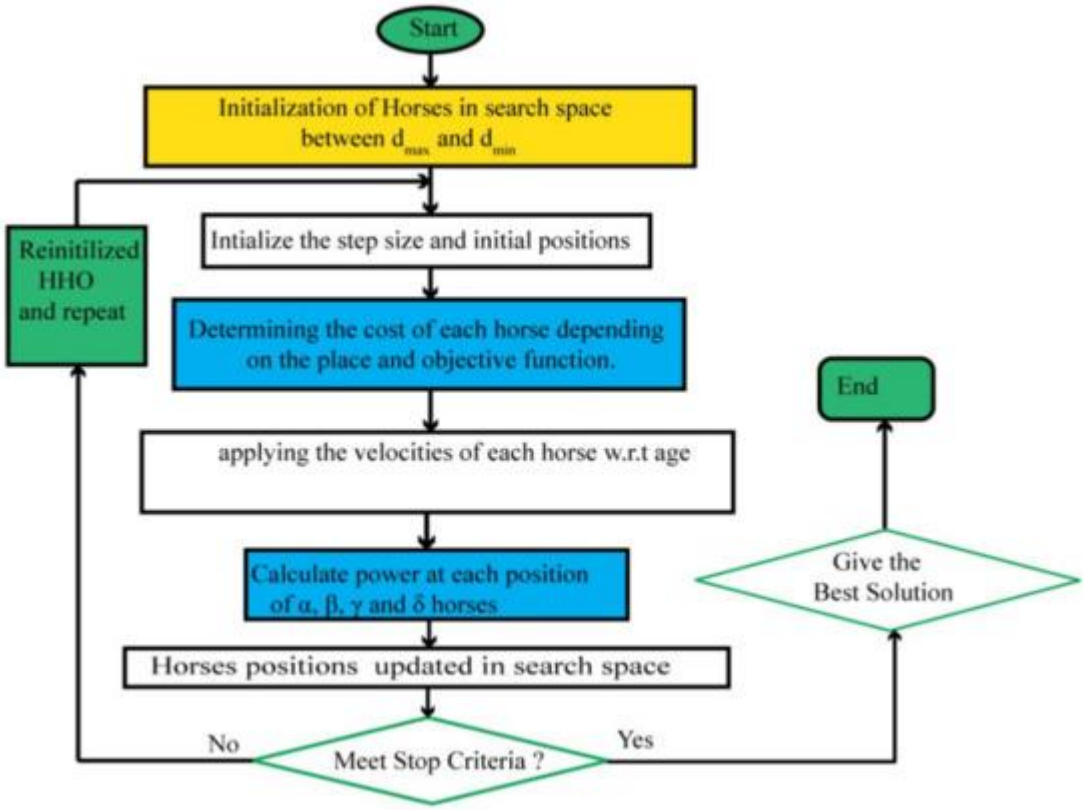

Fig no 1: Horse Herd Algorithm

A heuristic that may be used to address the issue of virtual machine (VM) deployment in a cloud data centre is called the Horse Herd Algorithm (HOA).The goal of the HOA is to minimize the energy consumption of the data center while still meeting the service-level agreements (SLAs) of the VMs. The HOA identifies a set of candidate VMs that can be placed on each server. The HOA then sorts the VMs by energy requirements and places them on the servers. The HOA tries to place the VMs on the server to minimize the data center's energy consumption. If the HOA is still looking for a placement that meets the SLAs of all the VMs, it will try to find one that meets the SLAs of the most critical VMs. The HOA will continue trying to find a placement that meets the SLAs of the VMs until it has found a placement that it is satisfied with. The HOA is a simple heuristic that can be easily implemented. The HOA is also scalable and can place VMs in large data centers.

Evaluation metrics

The need for efficient VM placement algorithms has also grown along with this increase. Many VM placement algorithms have been proposed in the literature, but most are designed for something other than software-defined networking (SDN) managed clouds. The HHA is explicitly designed for SDN-managed clouds and considers energy efficiency and meeting service-level agreements (SLAs). We evaluated the performance of the HHA using both simulation and real-world experiments.

The benefits of using SDN for VM placement

The benefits of using SDN for VM placement are many and varied. By using SDN, you can use the horse herd algorithm to achieve energy efficiency and meet SLA requirements in virtual machine placement for an SDN-managed cloud. The idea behind the algorithm is to use a heuristic approach to identify a set of potential placement options for each virtual machine and then select the option that results in the lowest overall energy consumption. This approach has several advantages. First, it is very effective

at reducing energy consumption. Second, it is relatively simple to implement and can be easily integrated into existing cloud management systems. In summary, using SDN for VM placement can offer several benefits, including improved energy efficiency, simplified management, and enhanced performance. Employing the Horse Herd Algorithm achieves energy efficiency and meets SLA requirements in virtual machine placement for SDN managed cloud. A recent study has shown that the Horse Herd Algorithm can achieve energy efficiency and meet Service Level Agreement SLA requirements in virtual machine placement for SDN managed clouds. The Horse Herd Algorithm is a placement algorithm based on the location of resources in a data center. The algorithm is designed to place virtual machines in a data centre to minimize the data centre's power consumption. The Horse Herd Algorithm is a powerful tool that can achieve energy efficiency and meet SLA requirements in virtual machine placement for SDN managed cloud.

Algorithm 2:

```
def software_defined_ networking(network):
controller=SDNController()
switches=[]
for switch in network.switches:
switch=SDNSwitch(switch,controller)
switches.append(switch)
for switch in switches:
for other_switch!=other_switches:
if switch!=other_switch
switch connect_to(other_switch)
controller.install_rules(switches)
return network
```

The challenges of implementing the HOA in a real-world setting

The Herd of Horses Algorithm (HOA) is a distributed algorithm that allows a group of virtual machines (VMs) to cooperate to achieve energy efficiency and meet service-level agreements (SLAs). The algorithm is based on a simple idea: VMs can cooperate to save energy, but they need to be able to communicate to do so. To implement HOA in a real-world setting, several challenges must be overcome. First, the algorithm must scale to large numbers of VMs. Second, the algorithm must be able to handle VMs that are spread out across multiple physical servers. Third, the algorithm must deal with the fact that VMs may come and go over time. Fortunately, recent advances in distributed algorithms and systems have made overcoming these challenges possible. The HOA algorithm has been implemented in several settings and is effective in small-scale and large-scale deployments.

Conclusion

The horse herd algorithm is a powerful tool for optimizing energy efficiency and meeting SLA requirements in virtual machine placement for SDN-managed cloud. This algorithm was first proposed by researchers at the University of Waterloo in Canada and is very effective in optimizing energy efficiency in several different settings. The horse herd algorithm works by considering the energy consumption of each virtual machine in a system and then placing the virtual machines in a way that minimizes the system's overall energy consumption. Placing virtual machines to decrease the number of active physical machines or decreasing the number of active virtual machines can accomplish this. The horse herd algorithm successfully improves energy efficiency in a variety of contexts. In one instance, the programme reduced a system's energy use by as much as 30%. In a different study, the algorithm successfully reduced a system's energy consumption by up to 40%. The horse herd algorithm should be considered when attempting to maximise energy efficiency in a system since it effectively reduces energy consumption.

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