VM Allocation Technique and Optimized Performance Improvement for the Cloud Architecture

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Abstract-

In the data center, virtual machines are used to distribute resources and programmes in accordance with beneficiary demand. Different ways are utilised to improve the performance and efficiency problems that cloud data centres encounter. In order to increase the efficiency of virtual machines and load balance tasks and resources, numerous ways are applied. Virtual machines can play a significant role in the development of data centre performance. Various VM criteria, such as makespan, quality of service, energy, data accuracy, and network utilization, are improved for the improvement of this. The performance of cloud computing is directly improved by modifying various VM characteristics. To benefit from virtualization in the cloud environment, the virtual machine is mapped onto the physical host.

Keywords: VM Allocation, Performance, Cloudlets, Virtualization.

1. Introduction

At the centre of the data center, a virtual machine is in use and is known as a "host". An individual physical system or host can support a large number of virtual machines simultaneously. An operating system or software behaviour of a computing system with a specific set of resource characteristics, such as CPU and memory capacity, is emulated by a virtual machine through virtualization [1].

A software-based element, the virtual machine is an abstraction of the underlying hardware made available via virtualization technology. By appropriately controlling the virtual machines, availability can be efficiently attained. One of the key components of a hypervisor or virtual machine manager is a model or software application that manages several VM operating systems on a single host [2].

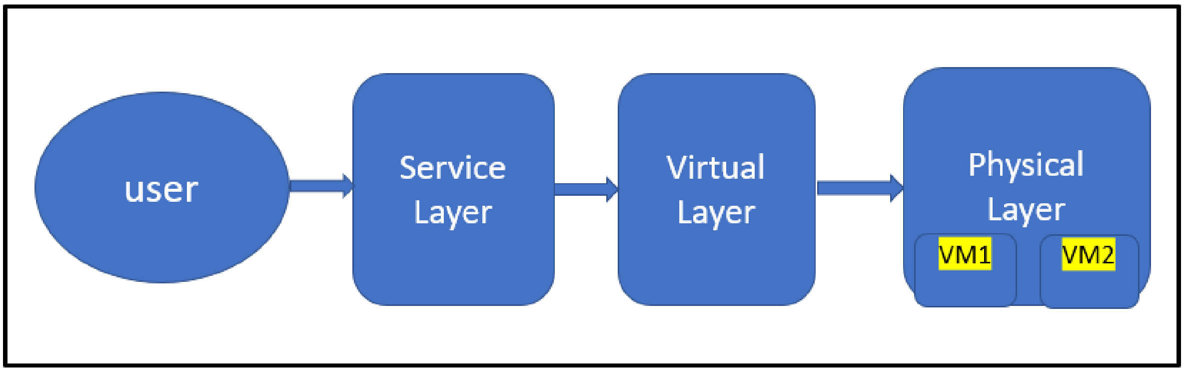

Figure:1 VM Allocation Layers

The virtual machines' allocation layers in the cloud environment are shown in Figure 1. There are primarily three tiers in cloud computing. The service layer facilitates user interaction, saves cloud service information in the service catalog, and displays cloud services to users. allows users to manage and access cloud services using a self-service interface.[3][4]. The physical layer carries out requests made by the virtualization, while the virtual layer abstracts physical resources and makes them look as virtual resources.

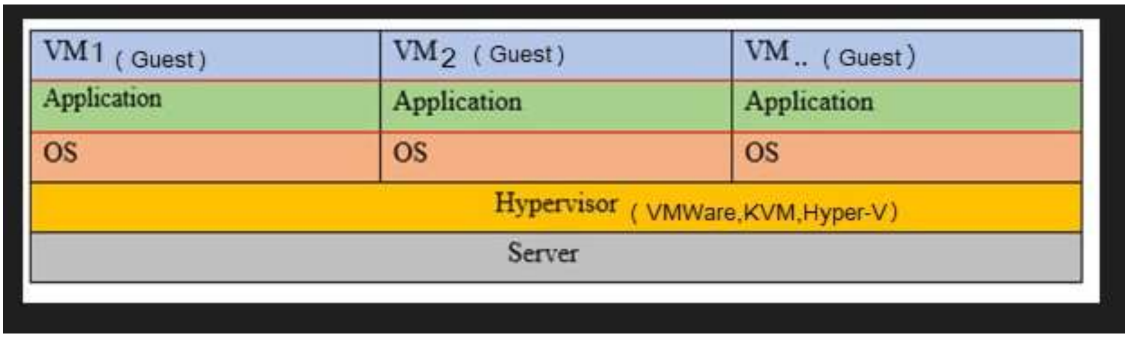

Figure 2 : VM Architecture

Figure 2 displays, In essence, a virtual machine (VM) is a software-based system that has access to the same software and hardware resources as a physical computer. Multiple VMs can be hosted by the hypervisor, which allows for far more effective use of the host machine's physical resources. For any service, application, or operating system, a virtual machine functions as a operating machine[6][7].

3. Proposed Methodology

For various objectives, a variety of VM placement techniques have been proposed. proposed a VM placement technique that evaluated the similarity between the peak workload of the VMs and the VMs' workload based on the parameters of the peak workload. The study gave a thorough overview of how Virtual Machines are mapped to Physical Machines and the influences they have on one another[8].

Allocation Policy of VM

Aim: The aim of this policy is to maximise resource utilization by keeping the host's processing components busy at all times.

The number of utilized processing elements for a specific host is stored in loaded PEs.

A one-dimensional statistic called Difference Matric records the disparities between new PEs and necessary PEs for each host in the data centre. The list known as "newPEs" is where the host's free space, or more particularly its free PEs (Processing Elements), are kept[9].

Input: VM List, Host List

Output: Updated Host List and VM list

Step-1 Initialize the newPEs and loadedPEs

newPE loadedPEs ← calculate(host)

For every VM request do steps 4

Allocate the virtual machine whose host satisfies the required configuration and whose host has

least difference value in difference

Step-2 find the difference.

for i ← 1 to total number of hosts

Difference[i] ← newPEs[i]- requiredPEs

End for

Step-3 Allocate the VM to the host which has the least.

difference

host_Id = minimum (Difference)

host[host_Id] = VM[VM_Id]

Step 4 Update all

for I ← 1 to the total number of hosts

newPEs[i] = newPes[i]-requiredPEs

End for

The virtual machine is moved to a less loaded node that is available after the algorithm's initial step assesses the node with the highest load. The algorithm selects the virtual machine to be moved after determining the source and destination. After virtual machine migration, this procedure will produce the data centre's ideal load-balanced condition. First, the algorithm is followed,

Calculate the load on each node in the data center.

i.e., Ⅲ= CPU Capacity + Memory Capacity + I/O Capacity + Network Capacity

Step -1. In the next step, the algorithm identifies the highest and lowest loaded node in the data center

Step -2. Once the source and destination are identified as MAX and MIN respectively, the identification of the virtual machine to be migrated is carried out. During the identification, the ad-balanced condition is identified.

VM(i) = VM(i) CPU_Capacity + VM(i) Memory_Capacity + VM(i) I/O_Capacity + VM(i) Network_Capacity

Ⅲ Max- VM(i) = Δ Source

Ⅲ Min + VM(i)= Δ Destination

Step-3. After the calculation of the new load, the source and destination nodes must obtain the optimal load condition, where the loads are nearly equally balanced.

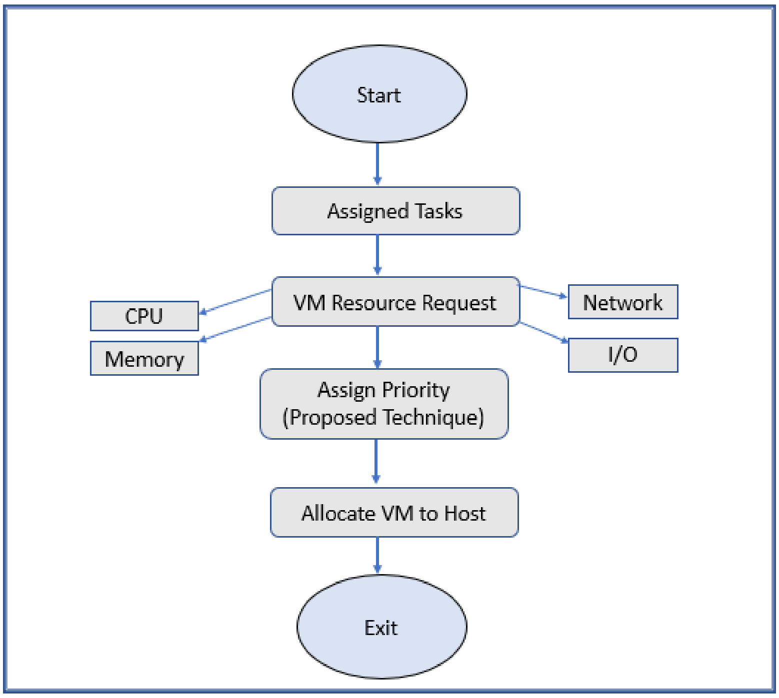

Figure 3: Flow Chart of Proposed Methodology

The suggested technique's workflow is depicted in Figure 3, starting with the number of jobs that are allocated from the various inputs. If there are more tasks than the threshold, the virtual machine chooses the fewest nodes from those that are available and assigns them to the host using the VM allocation method. Similarly, the maximum in typical circumstances.

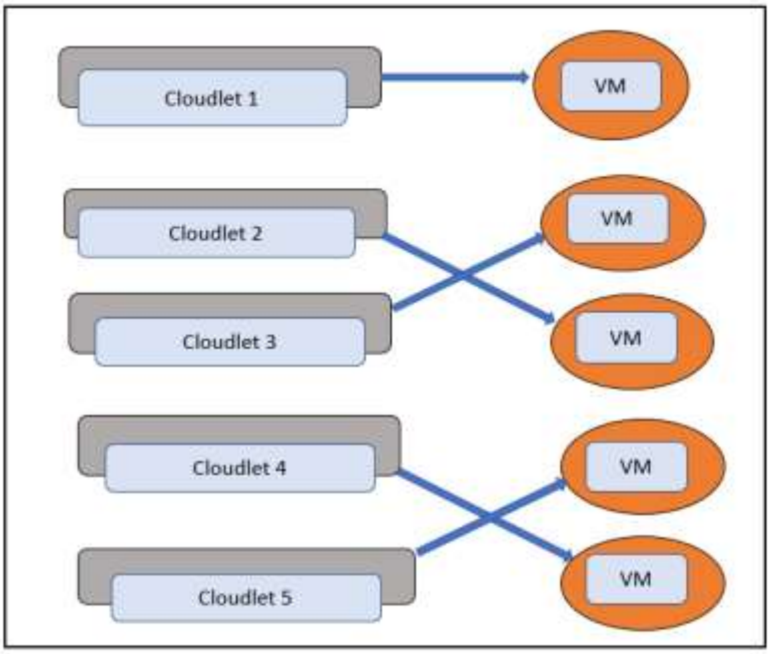

Figure 4: Mapping with Cloudlets and VM

Figure 4 depicts the manager's mapping of several virtual machines onto a physical host in accordance with the virtual machines' resource needs and the host system's capacity. employs virtual machine (VM) technology to quickly instantiate customised service software on a local cloudlet, and then utilises that service over a wireless LAN [10][11]. This innovative system architecture is proposed. For greater efficiency, use multiple mapping options in addition to selecting the VM at random. Dynamically deciding how to split the load between a maximum and minimal node occurs in dynamic load balancing, which divides the load at runtime[12]. In order to achieve prioritisation and efficient resource allocation, load balancing is used, which improves the performance and quality of cloud services.

5. Conclusion and Future Work

Through the gradual transfer of the work assignments on a shared basis, the suggested VM allocation mechanism enhances the system's sustainability. Equal work schedules by job Scheduling are provided by the virtual cloud network's overall efficiency, which helps to maximise performance and shorten reaction times. As a result, it is recognised as a crucial factor in streamlining the cloud service provider's operations. The design's objective is to model an accessible private cloud and formulate the problem of allocating virtual machines in terms of set theory. With the help of a straightforward but effective rule-based mapping method that has already been proposed and demonstrated, cloud customers can effectively run their virtual machines on a small number of real computers. As a result, this strategy will result in the effective use of resources, enabling maximal computing with minimal physical data centre infrastructures.

In the future, we'll endeavour to strengthen the following aspects of our VM allocation strategy: (1) Using OpenStack, we will test and validate its functionality. (2) Then, in order to improve the process of putting VMs, we will analyse the aspects that affect security, load balancing, and energy consumption. (3) Live VM migration is a crucial phase in a VM's lifetime that has received less attention than VM co-resident attack. There is a chance that the malicious tenant will be able to live alongside the target VMs. In the future, several scheduling strategies including round-robin, SJF, and FCFS will be considered.

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