An Approach Towards Analyzing Various VM Allocation Policies in the Domain of Cloud Computing

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Abstract. Cloud Computing has become a new age technology that has got the high degree of potency nowadays. Cloud Computing uses the concept of virtualization. It also provides resources to applications by allocating virtual machines to specific application. Optimizing resources in the cloud environment is more beneficial, minimizing allocation cost and satisfying client requests are the main purpose of working with VM allocation strategy. So, the resource allocation policies play crucial role for allocating and controlling the resources among several applications in cloud computing environment. This paper illustrates a comparative study on various VM allocation policies. The study and performance analysis of these algorithms are done on the basis of total allocation cost in between VM to Host considering different attributes and different service level agreements (SLA) in the domain of cloud computing.

Keywords: Cloud computing · Service level agreements (SLA) · Virtual Machine (VM) · VM allocation strategy (VAS)

1 Introduction

Cloud computing [10] is an imitation for validating convenient, on-demand web ingress to shared puddle of configurable computing assets (e.g., applications, services, servers) that can be swiftly distributed and delivered with minimum management strive or service provider dealings. Cloud computing presents a compelling solution for software evolution and ingress of data with transparency. The Cloud stage is generally sliced up of various datacenters and consumers have entrance to only a computational ability over a scalable network. The disposition of these computational assets is organize by a provider, and assets are allocated in a workable way, as per customer demands. The way to employ cloud stage for running software is thoroughly disparate thing than conventional implementations, where software runs atop infrastructures normally measure following

J. K. Mandal et al. (Eds.): CICBA 2018, CCIS 1030, pp. 344–351, 2019.
https://doi.org/10.1007/978-981-13-8578-0_27

Table 1. Allocation cost

Virtual Machine	Host	
	H_1	H_2
VM_1	5	10
VM_2	2	8
VM_3	4	4
VM_4	6	3
VM_5	5	2
VM_6	6	4

to the worst occurrence. To adjust unexpected requests on the infrastructures in a flexible procedure, the procedure of allocation and reallocation should be dynamic in cloud environment. Another fundamental feature of the resource allocation techniques in cloud computing is to assurance that the demands of all applications are appropriately met. Datacenter Resources are not only geographically distributed but also resource demand can modify dynamically by the customers at the moment of run time. So the resource allocation in such a large-scale distributed system is a vastly challenging task. Managing of resources are a main role of any dynamic systems, it also requires some involve policies and conclusions for the organizing of dynamic objective as for examples CPU. In cloud computing VM (Virtual Machine) allocation problem in datacenters is an exacting topic. VM allocation issue can be noticed in two ways - 1. static and 2. dynamic. A VM allocation points to map each VM to host a given objective role for optimization. The objective role can be minimizing for execution time, maximizing utilization or providers profit. The VM allocation policy [12] assists in creating an instance of VM to a host inside a datacenter. The allocation of VM can produce of higher quality utilization of hosts processing ability. Also, it may assist in minimizing makespan of cloudlets and the total completion time. Designing a superior VM allocation policy is a difficult task in the domain of cloud computing We have considered three VM allocation policies which are 1. Serial VM Allocation Policy [1] 2. Optimal VM Allocation policy [1] and GS VM Allocation Policy [2] for Vm Allocation. Using these policies we have computed total allocation cost (cost means execution time) of VMs for allocating to the host. After computing the results we have seen which algorithm is most appropriate to reach our objective means calculating the VM allocation cost for each algorithm and comparing with each other. Table 1 represent the allocation cost to allocate each VM to the each host. As for examples Time require for allocate VM_1 to H_1 and H_2 are 5 and 10 respectively.

2 Related Work

Virtual Machine [12] is a crucial module which is controlled by Virtual Machine Monitor (VMM) or hypervisor such as VMware, XEN, KVN etc. The Cloud users submit a job into the datacenter through the cloudlet. Cloudlet is a collection of jobs to employing for services. The service appeals of the cloudlets are completed by the VMs. The correspondence between VMs and Cloudlet is controlled by a broker policy [14,15] which is called DatacenterBroker [16]. Each datacenter subsists of physical nodes which are called hosts. The VMs are appraised as logical machines which can execute some specific operations. The VMs are allocated into the hosts. The VM allocation [17] into the hosts are handled by VM allocation policy [14]. The VM allocation approach selects hosts from a datacenter that fulfills the VMs requirement. The VM Scheduler [14] is responsible for allocating hosts processing cores to the VMs either in time-share or in space-shared approach. Tziritas et al. [7] proposes network load minimization and energy efficiency. The authors propose algorithms are for application aware workload consolidation, considering both separately as well as together. But the authors consider a cloud domain with an initial placement. Then attempt to optimize the VM allocation by migration for attaining network load minimization and energy efficiency. Cura [4] allocates previously clustered VMs for MapReduce cluster. However, in this case the problem is over-provisioning of the resources. Exactly Equal no of VMs may not be accessible for clustering for all the time. This over-provisioning can lead to starvation of other requests. Shabeera and Kumar [9] proposed algorithms to allocate VM in MapReduce cloud. They suggested PAM, Greedy and random based algorithms to allocate VM into the host. They are not examining the data arrangement. CAM [5] uses a min-cost flow model for VM and data arrangement by reviewing storage utilization, modifying load of CPU and link of network capacities. This proposal considers both delay scheduling and VM migration. But the problems of these techniques are append additional overhead to the system. He et al. [8] proposes VM consolidation for energy saving by considering VMs as moldable. Moldable VMs can modify their resource capacities in the time of consolidation moment without jeopardizing QoS. Alicherry and Lakshman [6] proposed an algorithm for resource allocation in distributed cloud system. The authors examine the allocation of VMs only. They want to show approximation algorithm for allocating VMs in nearest data centers. Alicherry and Lakshman [3] proposed algorithms of placing VMs in cloud system for optimizing data entrance latencies. The data location is already accessible and they also attempt to minimize the distance of inter-VM and distances of VM-data node. But without optimizing arrangement of data, VM placement optimization may not provide a superior outcome.

3 Experimental Results and Performance Analysis

In this section we have describe three different virtual machine allocation policies and shown the procedure of the allocation of VM into the host. For experiment all the algorithms we have taken six VM VM_1, VM_2, VM_3, VM_5, VM_5 and VM_6 and two host H_1 and H_2. Allocation cost for each VM to allocate into the different host are showing Table 1. We have also taken C_{ij} (i denotes as VMs number and j is denotes as hosts number) as a parameter to compute the allocation cost for particular algorithms. Using all the C_{ij}s value we have calculate the C_{TOTAL} to compute the allocation cost for each algorithms. We have optimized the VM allocation cost after computing total allocation cost for each algorithm.

3.1 Serial VM Allocation Policy

In this policy we used Seiral Task Assignment Approach (STAA) algorithm for allocation of VMs. First some VM allocate to H_1, next to H_2 and so on. So in this policy VM must be allocated to the host serially. In this approach we have seen first 3 VM allocated to H_1 and next 3 VM allocated to H_2. Using this approach We have shown the allocation of VMs to the host in Table 2. Here total allocation cost $C_{TOTAL} = C_{11} + C_{21} + C_{31} + C_{42} + C_{52} + C_{62} = (5+2+4+3+2+4) = 20$.

Table 2. Serial VM allocation

Virtual Machine	Host
VM_1	H_1
VM_2	H_1
VM_3	H_1
VM_4	H_2
VM_5	H_2
VM_6	H_2

3.2 Optimal VM Allocation Policy

In this policy we used Optimal Task Assignment Approach (OTTA) algorithm for allocating VM into the host. Here each VMs must be allocated to every host to diminish total allocation cost. We have shown in Table 3 how to allocate VMs into the host using OTTA algorithm. In this policy first 5 VM allocated to H_1 and next 1 allocated to H_2. We have calculated total VM allocation cost using this algorithm and here total allocation cost is $C_{TOTAL} = C_{11} + C_{21} + C_{31} + C_{41} + C_{51} + C_{62} = (5+2+4+6+5+4) = 26$.

3.3 GS VM Allocation Policy

We have computed VM allocation policy using Gale/Shapley (GS) algorithm [11,13]. Purpose of this algorithm pair each VM to each host and get stable matching. We have selected VM and host preference list depending upon which VMs allocation cost to the particular host should have minimum allocation cost. Here a host can be hold more no of VMs. We have shown the VM allocation to the host in Table 4 using this algorithm. We have calculated the allocation cost using each VMs allocation cost for particular host form Table 1. Total allocation cost is $C_{TOTAL} = C_{11} + C_{21} + C_{32} + C_{42} + C_{52} + C_{61} = 5+2+4+3+2+6 = 22$.

Table 3. Optimal VM allocation

Virtual Machine	Host
VM_1	H_1
VM_2	H_1
VM_3	H_1
VM_4	H_1
VM_5	H_1
VM_6	H_2

Table 4. GS VM allocation

Virtual Machine	Host
VM_1	H_1
VM_2	H_1
VM_3	H_2
VM_4	H_2
VM_5	H_2
VM_6	H_1

4 Comparison and Analysis

We have analyzed the performance of VM allocation cost using three algorithms (STAA, OTTA and GS). After computing we have seen that STAA algorithm results minimum allocation cost and more details are showing in Table 5. Different allocation cost has shown using graphical view in Fig. 1 and easily we can differentiate which algorithms are better for VM allocation. Seeing at the Table 5 we can easily said that serial VM Allocation Policy have taken minimum cost for allocating VMs into the host. We have also calculated AVMUTR (Average Virtual Machine Utilization Rate) for all policies particularly. AVMUTR is better in Optimal VM Allocation Policy. The Different AVMUTR of these policies have shown in Fig. 2 and also Table 6.

Table 5. Allocation cost comparison

Sl. no.	Policy	Allocation cost
1	Serial VM Allocation Policy	20
2	Optimal VM Allocation Policy	26
3	GS VM Allocation Policy	22

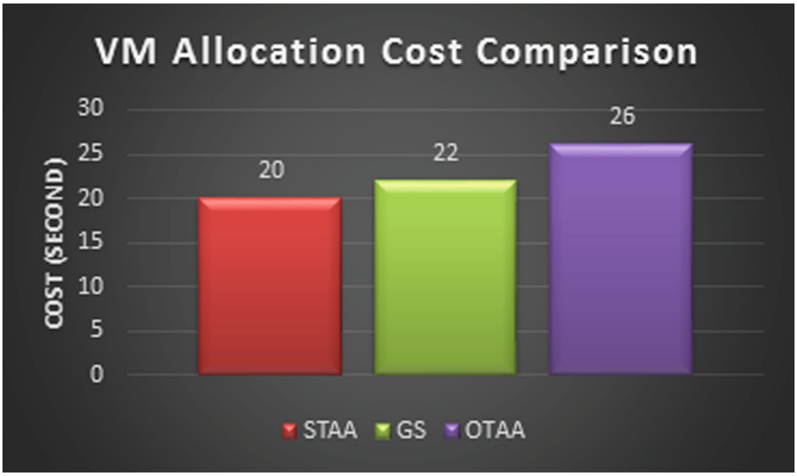

Fig. 1. Comparison of VM allocation cost

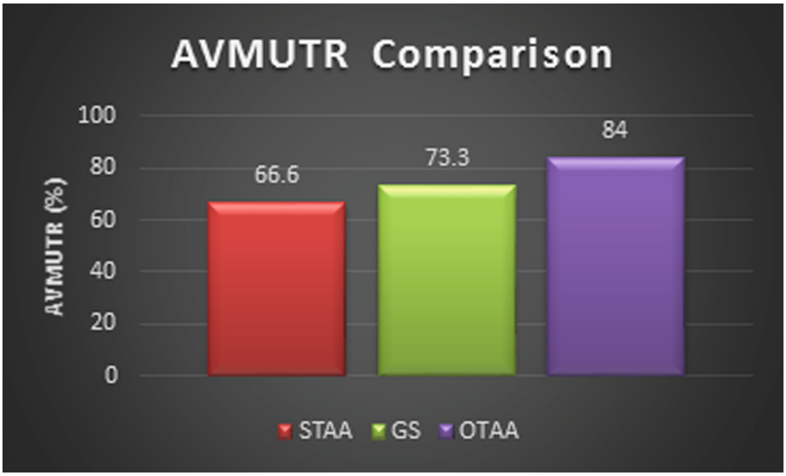

Fig. 2. Comparison of AVMUTR

Table 6. AVMUTR comparison

Sl. no.	Policy	AVMUTR (%)
1	Serial VM Allocation Policy	66.6
2	Optimal VM Allocation Policy	84
3	GS VM Allocation Policy	73.3

5 Conclusion and Future Work

In this paper, we present VM allocation policies for cloud computing. By selecting more number of VM allocation policies, allocation cost can probably be reduced. From all studies and comparison analysis, we can decided that Serial VM Allocation policy is better allocation policy for VM allocation into the host as it has taken minimum Allocation cost. Selecting an appropriate allocation policy will have enduring profits continue to enhance future.

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