Allocation strategies of virtual machine for cloud Environment: A review

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***Abstract* - Cloud computing is the most integral part of todays world of computing. It provides various advantageous like reliability, economical, pay as you use, on demand service. Cloud hides the ambiguity of different hardware through virtualization technology. Virtualization is the foundation of cloud, it provides Infrastructure as a Service (IaaS), Software as a Service (SaaS) and Platform as a Service (PaaS). As cloud infrastructure heavily relies on virtualization technology, so there is a requirement of an absolute virtual machine allocation method. Resource allocation is most emerging research area in cloud environment. This has led to a new area in the literature dealing with the issue of assigning virtual machines with variable demands to physical servers in such a way that performance is enhanced and system becames more scalable. Cloud providers faces a huge problem of designing effective mechanisms for virtual machine (VM) allocation and their provisioning. Good mechanisms is helpful for cloud service providers to effectively use their existing resources and achieve higher productivity and profit. By using different approaches like performance, energy, cost in allocating resources make it easier and improves the scheduling of virtual machines. This survey explore the various virtual machine allocation paradigm.**

***Index Terms* – cloud, virtualization, cluster based, energy efficient, performance, data aware, network, SLA**

I. INTRODUCTION

Cloud computing is wide area that covers most of todays technology and things. More and more organization moving towards the cloud environment. It has main three types Software as a Service, Platform as a Service and Infrastructure as a Service. SaaS provides the service over internet, user accesses service by GUI based application or from browser. Paas avail the user to run, develop or manage the application without difficulty of building development environment. Iaas provides storage, network, processing and other functionality to user. User can control the underlying hardware which is maintained by the service provider. Cloud uses the virtualization technology. Virtualization provides the dynamic allocation and release of resources [14]. Hypervisor is program that combine all hardware resources so it seems as single component or machine with more power and functionality. For example hypervisor combine all the memory, processor and disk space so it can serve as total power of all combined resources. Total virtualized memory is summation of all individual memory. Resource is allocated when required and release to cloud pool when work is done to save the energy and cost while maintaining the performance and efficiency. Another advantage of virtualization is that it is easy to expand the hardware capacity and easy to remove unwanted hardware resources. To achieve proper outcomes from cloud it is essential to allocate resource in effective manner, thats why different allocation strategy is available to serve the purpose.

II. VM ALLOCATION STRATEGY

For achieving quality of service into cloud it is essential to allocate resources effectively. Random allocation of virtual machine into physical machine cause performance degradation, more energy consumption which raise the cost of service. [15]There are various policies available to allocate VMs. Figure 1 shows the list of allocation strategies that mainly taken into consideration while managing cloud resources.

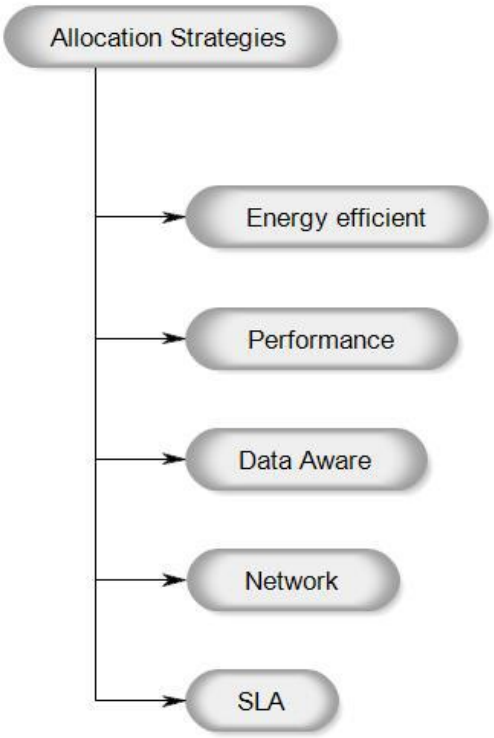

Fig. 1: list of allocation strategies

A. Energy efficient

A Beloglazov et al. [1] proposed allocation of VM can be categories into two ways: first one is allocating VM to free host in cloud, second one is optimization of already allocated VM in cloud. For first case bin packing approach with variable bin size and price is considered. Modified Best Fit Decreasing (BFD) algorithm helps to solve the problem and allows to power efficient allocation of VM. Jian Cao et al. [2] proposed demand forecast based approach for energy based allocation of VM. It uses time-variant demand for seasonal pattern. Demand is determined by the number of requests for every VM. Ruitao Xie et al. [3] proposed power saving state where idle or host with less number of VM switched to power saving state so that VM can continue on other available host. Also energy consumption during switching VM to different host can cause overhead to energy.

B. Performance based

Mahesh B. et al. [4] proposed dynamic resource allocation method which allocate VM dynamically based on the demands. It uses concept of skewness which is measure the current workload of hosts and avoid overload and under load by allocating VM to proper hosts. So that un-evenness of VM is optimized. S. Abar et al. [5] proposed symbiotic simulation based scalable prototype which provide support for autonomic VM allocation. It uses statistical data to decide whether host is appropriate to serve new VM or migrate some serving VM to other host to increase the performance.

C. Data aware

In data aware allocation strategy each allocated VM need some central data or file to carry out different operations. Sometimes these data file need to be migrate from one VM to other VM to continue uninterrupted VM functionality. Jing Tai et al. [6] proposed a novel approach for data-intensive operation of VMs to reduce the overburden of data access between different VMs by manipulating machines demands and other network related parameters like access time and location of data at different hosts.

D. Network based

Placement of VM in cloud achieves effectiveness if network overhead is minimized. Several VMs are communicating with each, even though VMs resides at different host. This network communication requires some bandwidth and connection to destination VM. Which put some drawback into cloud if two VMs, which needs communication most frequently but distance between VMs is very large. This type of issue makes more traffic and makes the communication link all-time high. Jian guo et al. [7] proposed game theory approach for network aware VM allocation. It has main two objectives, first one is guaranteed bandwidth for each VM, which is predefined based on the requirements, second one is sharing of residual bandwidth among VMs, which are sharing same communication link. This provides quantitative network utilization.

E. SLA based

For achieving Qos in cloud services SLA is negotiated between cloud service provider and cloud user. SLA violation cause penalties and interruption to service, but sometimes service provider violate SLA willingly to provide better service performance by upgrading or fixing bugs into previous service. Waheed et al. [8] proposed a tier based SLA prototype, which identifies bottleneck and resolves it. Prototype focus on two scaling methods, First one is horizontal which handle load balancing related issues, Second one is vertical scaling which handle migration and expansion related issues. Aaron et al. [9] proposed multitier

monitoring and manipulation approach, which provides scalability. Into model host, cluster and cloud innkeeper broker provides scalability and dynamic hierarchy to achieve more SLA compliance.

III. CLUSTER BASED STRATEGY

Different VM allocation strategy came with their own limitation and advantages. Clustering approach is one that combine particular host into one group based on their state like free, fully loaded, partially loaded, underutilized etc. Shindler et al. [10] proposed k-means clustering based accurate and fast approach to deal with allocation of VM issue, where large amount of data accessed at a time. Bhupendra et al. [12] proposed dynamic VM allocation algorithm. Which uses the k-means clustering method. K-means algorithm divides VM request into groups. It is a partition method, which may has centroid. So each paratition group has centroid, which maps nearest VM point. It is recursive method to find best cluster of VMs. Hemalatha et al. [13] proposed honey bee clustering algorithm, which search for best host that can server newly VM request like nature of bee. It also provide support for reallocation of VM and reduces network latency. Malathy et al. [11] proposed novel approach, reservation cluster. Into that reservation cluster schedule the unscheduled VM request tasks. Reservation cluster schedules the all task into concurrent manner, so less computation time and reduced resources usage. This reservation cluster approach provides better performance. Figure 2 shows the diagram of reservation cluster model.

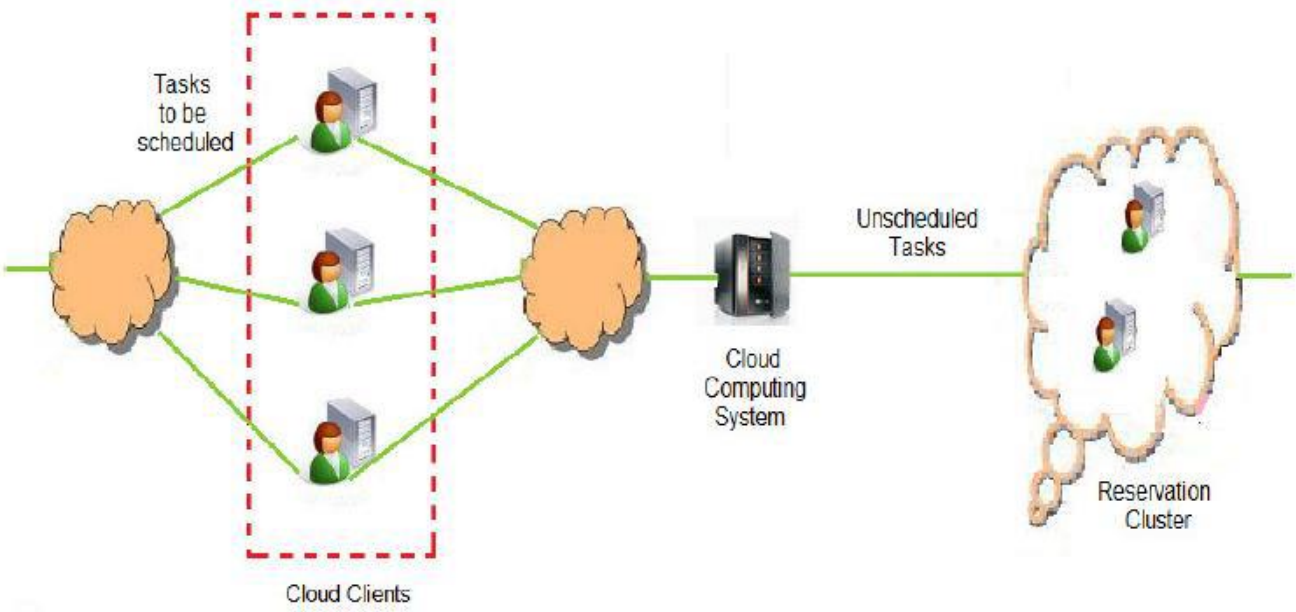

Fig. 2: reservation cluster model [11]

IV. CONCLUSION

In cloud environment, Infrastructure as a service maps the virtual machine request to physical machine. Demands of user is dynamic, so many virtual machine are allocated and released to cloud pool at the same time. Allocation of machine need consideration of performance, energy, cost and other parameters. Various policies are available for allocating resources. Performance based policies increase the power by effective utilization, while energy based policies saves the energy by switching off ideal and least loaded host to achieve green computing. Network, data aware and SLA based policies provides scalability and reliability. Different policies have their own advantageous and limitation, but trade-off of different policies provide effectiveness and efficiency. At last cluster based approach is explored, which makes group of identical VM request and based on groups allocate to the physical machine.

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