Time Efficient VM Allocation using KD-Tree Approach in Cloud Server Environment

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Abstract— Cloud computing is an incipient and quickly evolving model, with new expenses and capabilities being proclaimed frequently. The increases of user on cloud with the expansion of variety of services, with that the complete allocation of resource with the minimum latent time for Virtual machine is necessary. To allocate this virtual cloud computing resources to the cloud user is a key technical issue because user demand is dynamic in nature that required dynamic allocation of resource too. To improve the allocation there must be a correct balanced algorithmic scheduling for Resource Allocation Technique. The aim of this work is to allocate resource to scientific experiment request coming from multiple users, wherever customized Virtual machines (VM) are aloft in applicable host out there in cloud. Therefore, properly programmed scheduling cloud is extremely vital and it's significant to develop efficient scheduling methods for appropriately allocation of VMs into physical resource. The planned formulas minimize the time interval quality so as of O (Log n) by adopting KD-Tree.

Keywords— *Cloud Computing; Virtualization; Scheduling;* VM *Allocation*

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I. INTRODUCTION

Computing is a field of study that help in implementing the standard scientific issues in disciplines like Molecular science, Earth science, Bioinformatics and even a lot of. Computing is related to substantial large-scale computer simulation and modeling and infrequently needs computer resources to satisfy the experiment.

Cloud computing [1] is an ideal for executing the computing issues with due consideration of its commitment of provisioning wide resources. So many professional explained it in their ways, Cloud computing is a style of computing which rely on distribute resource rather than its inherent local servers or own devices to manage different applications. Clouds computing is a utility delivery computing instead of product due to the fact in cloud computing the resource are placed at distinct location and their respective resources are access via network as a service on the idea of pay as you go [2]. By virtualization technology resources provided by cloud can be used dynamically and effectively. There are three flavor of cloud computing: platform, infrastructure and software as services. Framework of cloud computing consist of deployment model, delivery model, characteristic and resource shown in figure 1.

The services in cloud are made accessible to clients on a pay-as-you-utilize model. The use of various cloud computing techniques finding its roots in IT environments. Presently, there are many commercial Clouds that provide platform-level Services or applications, computing or storage resources.Additionally, By using open-source Cloud Computing ,its accesible to create private Clouds (i.e., intra-data-center).

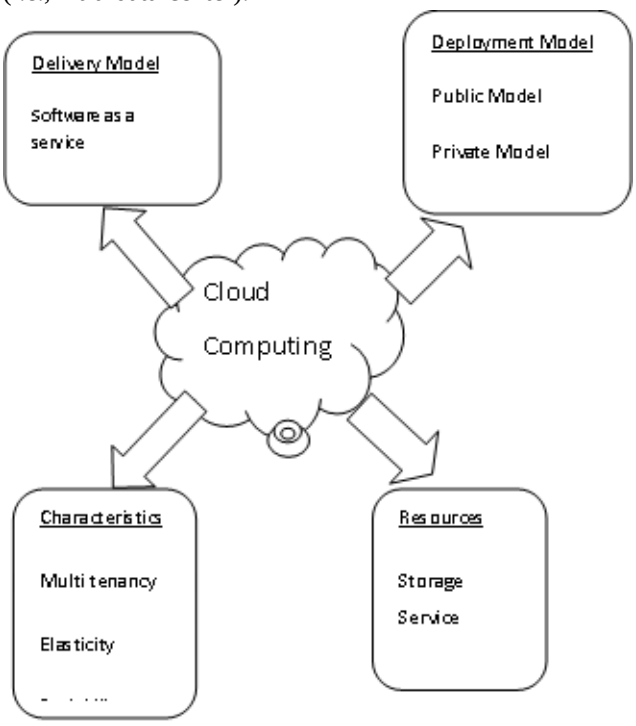

Fig 1: Frame Work of Cloud Computing

This work is concentrated on the Infrastructure as a Service (IaaS) model, wherever physical resources are manifest as utility. In this type of model, users demand virtual machines (VM), which are allied to physical resources.

However, so as to attain the most effective and efficient performances, the physical resources are totally utilized by VMs by complying with the dynamically Cloud atmosphere. To adopt this, scheduling the process is a vital concern and it's fundamental to have dynamic scheduling method's to suitably assign the VMs in physical resources. In cloud scheduling refer means allocation of VMs. The responsibility of allocation of VMs is of scheduler. Scheduling techniques are of two types in cloud: dynamic and static. Static VM scheduling relies according to earlier information of each entity, nevertheless dynamic scheduling relies on the instant mode of the model. User demand is potent in nature, that the dynamic scheduling is much better than the static VM scheduling however it's ton of overhead. Here we have proposed dynamic resource appropriations technique which reduces the resource time of client request. The experimental result shows that the proposing techniques gives minimum time in VM allocation process.

The results of paper refer to approach as follows:

- Reduce the response time: The call of client for assigning the appropriate host with minimum latency.
- VM placement: It grants the VM provision policy by providing the VM to PM.

The additional of this paper is deprived as follows. Section II describes the necessary background to understand the concept. Then section III describes the related work.

II. Literature Review

Cloud Computing has become a computing ideal which has been newly induced all over. Cloud computing provides platform, application and computing resources which are made access anywhere. Moreover, Services provided by cloud resources are highly scalable and dynamic and provide end-users array of services. Cloud utilities are vast ample to cover any topic required for the research.

1.1 Cloud Computing Basics

As the developing quality of Cloud Computing necessitate too many analogues, as mentioned by Vaquero [3]. Some of the definitions proposed by scientists which include:

- RajkumarBuyya [4], define it as: Cloud is a consolidation of distributed and parallel computing, which is consisting of a set of virtualized and interconnected computers that are dynamically provisioned and released
- R. Cohen[5] Define it as: Cloud computing is one of those catch buzz words that tries to encompass a many of aspects ranging from load balancing, deployment, business model, provisioning and architecture (like Web2.0). It's the next logical step in software (software 10.0). For me the simplest explanation for Cloud Computing is describing it as, *internet centric software...*

Cloud model is consisting of three types of service i.e. Platform as a Service (PaaS), Infrastructure as a Service (IaaS) and Software as a Service (SaaS) as shown in figure 2. The four types of deployment models in cloud are public, protected, community and hybrid [6]. Whereas the main qualities are: wide network approach, on-demand self-service, rapid flexibility,merging of resource and regular services.

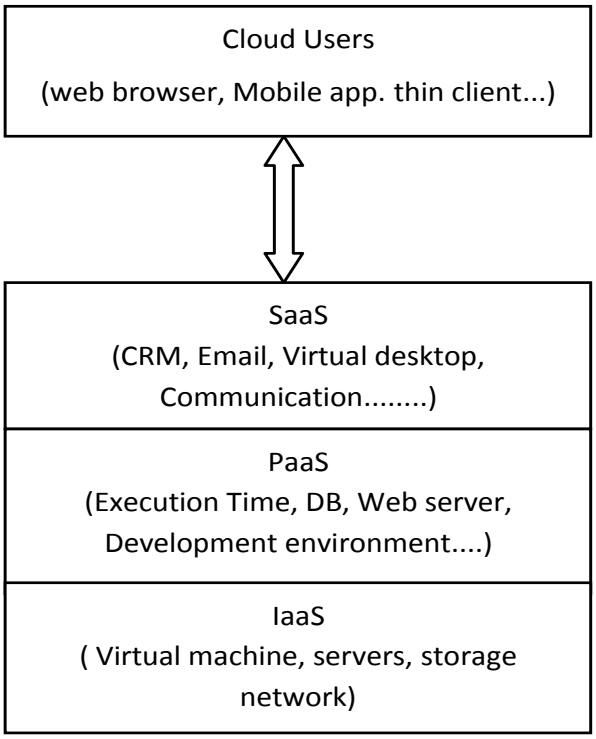

Fig. 2. Cloud computing service model

Cloud Computing is the abstraction of virtualization, i.e., the potential of a system of imitating n number of OS. In a Cloud, for providing resource flexibility to each user and stability and security from one another, virtualization is an important mechanism in cloud environment. The best use of an algorithm and data structure for the allocation of VMs from data center can lead the system efficient. For achieving high quality performance and to boost the resource utility proper allotment of resources is most vital job in cloud environment. On an IaaS in job scheduling, at one level the requests are mapped to physical resources (execution middleware) using the first come first serve basis, resources are scheduled at second level infrastructure or Cloud wide and VM-level.

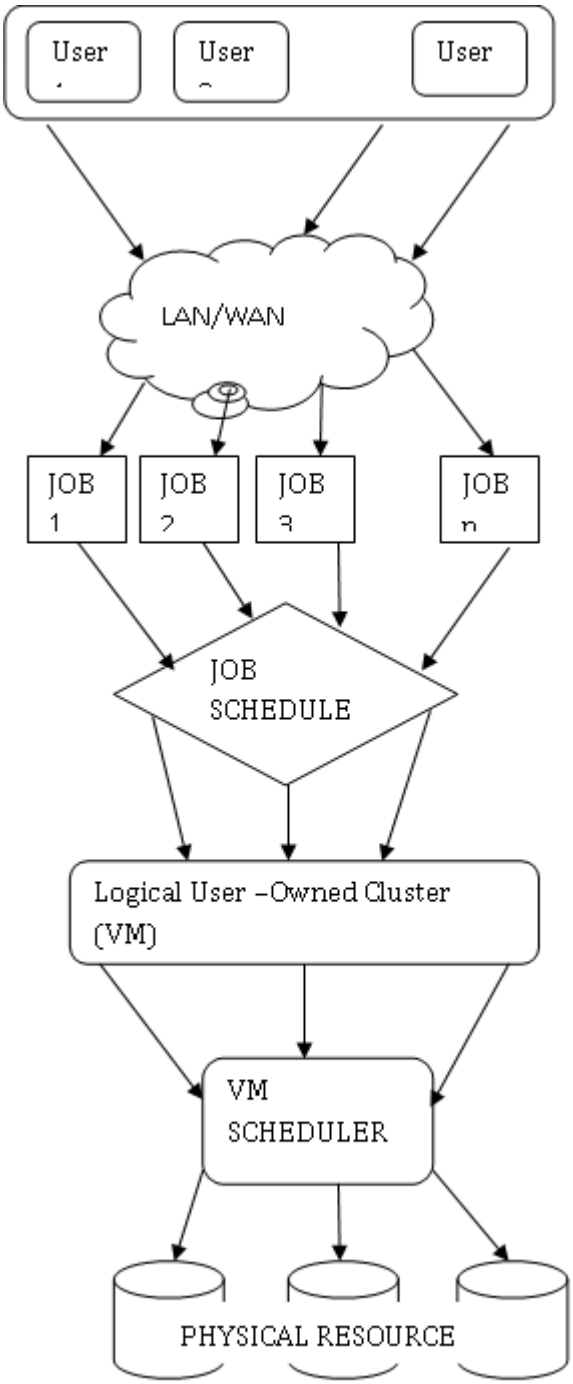

Fig 3. High level view of Cloud Computing

The best use of algorithm and data structure for the allocation of VMs from data center can lead the system efficient. VM scheduler creates as much as cloud infrastructure is required and the VMs are mapped into suitable substantial hardware. For convenient task scheduling suitable data structure is applied at the VM level. Each task are mapped into virtual resources for convenient execution. Task scheduling connect jobs to a convenient resources to execute, and the delivered efficiency make performance of cloud environment better.

1.2 KD-Tree:

A *k-d* tree which is a non-linear data structure is also familiarly as *K-D*imensional Tree [7]. *k-d* tree is a binary tree with further suppression based on it. *k-d* tree is a binary tree with other suppression based on it. *k-d* tree as a binary tree that keeps *k-d*imensional data in each node. *k-d* tree is effective data structure for various operation, like searches involving a dimensional search key (e.g. nearest neighbour searches and range searches). K-Nearest neighbour (KNN) function is to fetch the closet adjoin using the base value of k, which results in how many Nearest Neighbour (NN) are there about to details the category of a sample datum.

The KNN combines and ties the one point to its closest neighbour. The user request many input like a point in multidimensional space and a range point in the space. The *k-d* Tree partition the data at each level of tree same as done by Binary Tree [8]. The k-d tree has been inherited from binary tree where each node represents a k dimensional point. Each leaf node can be deduced of to completely generate a cleaved hyper plane that partition the space in to two branch, called as half-spaces. Point left to the hyper-plane shows the left sub tree of that node and point's right of the hyper-plane are represented by the right sub tree. The direction of hyper plane is selected in the resulting manner: every node in the tree is linked with one of the k dimensions, with the hyper-plane perpendicular to that dimension's axis.

III. Related Work

Resource allocation is one of the most significant problem in the resource management issues of cloud environment. The dynamically allotment of resources in cloud environment has gain the consideration of many researches.Therefore various resource allocation techniques has been anticipated in the leaflet for optimizing the time of allocation. W. Tian et al. [9] proposed algorithm called DAIRS for dynamic resource scheduling for cloud datacenters. Abirami S.P. and Shalini Ramanathan [10] proposed an algorithm resource allocation based on Linear scheduling strategy (LSTR). R. Buyya et al [11] discusses balanced allocation of resource algorithm based on First Fit Decreasing technique (FFD).

IV. Proposed Work

The proposed work for the VM placement will effectively solved the issue with minimization of latent time cloud data center as shown in figure 4.

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Algorithm 1: Host Creation or Datacenter Creation Process

1. N Number of host
   Resources types=3
   (Mem, BW and CPU)
2. While 0 to n-1
3. Create a host[i]
4. Initialize it
5. Adds the **Host[i]** into the **Host-Array** using FCFS
6. Now using **KD-Tree** insertion operation insert the host in tree
7. And so on

As the client request arrived for the resource requirement, creation of new VM take place on PM. There are various selection strategy are which can be elected as PM to host the new created VM. Proposed work foucses on minimizing the reponse time in order O(Log n). As the request arrives for the placement of VM, the scheduler fetch the VM from the pool and placed it on the proper host. The host in the picked from the list and searched according to proposed algorithm. When the request arrives for VM placement at cloud data center, scheduler determines the best list and using *k*-d-tree nearest neighbor to find the best in resource capacity than the VM required capacity in entire dimension as shown in Algorithm 2.

Algorithm 2: Searching of Node for VM Allocation Process

1. Create the VM.
2. find_nearest()
3. if(!Root_host)
4. Turn on the new host.
5. end if
6. checked_host= zero;
7. Parent_host = Finds the parent of a target host;
8. Nearest_host = parent_host ;
9. Check_subtree(Root, x);
10. return nearest_host
11. end procedure

V. EXPERIMENTAL RESULT

The proposed work is done by using Cloudsim tool kit [12] [13]. Cloudsim is a frame for Modeling and Simulation of Cloud Computing infrastructures and utilities. All the result are done using a core i5 window with 3.60 GHz CPU. We have compare our work with LSTR algorithm, where we found our proposed work gives better result then it.

Table 1: Resource Allocation Table

Virtual Machine	Allocation Time (Proposed work) (MS)	Allocation Time (LSTR) (Micro second)
{5,5,5}	2824.934	367.62
{10,5,2}	87.544	224.594
{10,2,5}	57.96	359.839
{5,10,2}	79.09	251.541
{2,10,5}	91.166	509.278
{5,2,10}	60.978	451.318
{2,5,10}	64.601	286.558
{5,5,5}	53.734	314.108
{20,10,4}	79.694	432.79
{20,4,10}	74.261	362.99
{10,20,4}	89.959	48.3
{4,20,10}	74.261	213.123
{10,4,20}	80.902	444.943
{4,10,20}	51.219	335.018

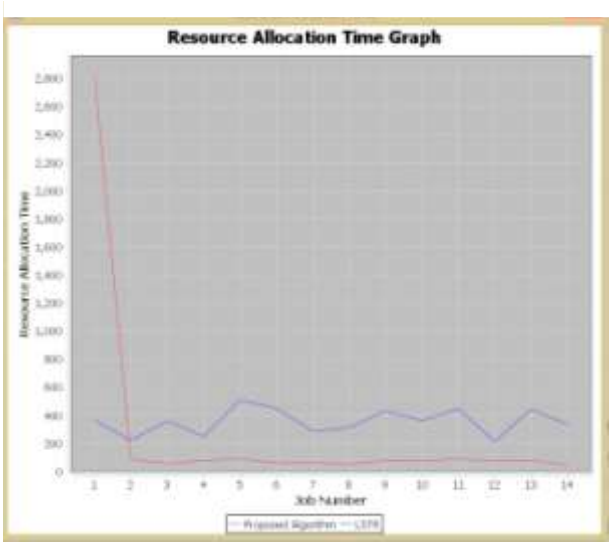

Fig: 4 Resource Allocation Time Graph

VI. Conclusion And Future Work

The Job scheduling has received attention in the research community. The job must efficiently processed in any computing environment such as Cloud computing. It involves large number of computing with independent jobs. Cloud scheduling is NP-complete problem [14]. Therefore many experiments have done on it. Our work describes the efficient scheduling technique which provides proper resource allocation with minimum latent period. The work gives better result than other traditional technique. Proposed work is done using Cloudsim toolkit. Our work is concentrate on the IaaS, where VMs are carried out as host within the data center, energy consumption is an issue.

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