Hungarian Method Based Resource Scheduling algorithm in Cloud Computing

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ABSTRACT

Resource scheduling is one of the key problems of cloud computing, no wonder, the scheduling policy and algorithm affect the performance of the cloud system directly. In order to improve the utilization of cloud computing resources and keep load balancing, a cloud computing resource scheduling algorithm based on estimation of distribution algorithm is proposed in existing paper, In this algorithm, the idea of population based incremental learning(PBIL) algorithm is used. But there is Priority of task is not considered during VM allocation, so there is possibility of task having higher priority need to be scheduled first then other. So I will use Hungarian method for solving that problem. Using Hungarian method we can able to show resource allocation for available jobs using data. Also Hungarian method is simple to implement and works in balanced as well as unbalanced condition.

Keyword : - *Cloud Computing, Resource scheduling, PBIL Algorithm, Hungarian Method;*

1. CLOUD COMPUTING

Cloud computing means the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer. In cloud computing, the word cloud is used as a metaphor for "the internet" so the phrase *cloud computing* means "a type of Internet-based computing," where different services — such as servers, storage and applications — are delivered to an organization's computers and devices through the Internet. Three types of cloud computing is deployed and is called the deployment model of the cloud computing. Public cloud, Private cloud, Hybrid Cloud. Public cloud is available for public use anyone access that cloud. Private cloud is deployed for any personal organization's employee use. Hybrid cloud is combination of both public and private cloud. Three type of services provide by Cloud, IaaS ,Paas & SaaS. IaaS provides virtual machines, virtual storage, virtual infrastructure ,and other hardware assets as resources that clients can provision, SaaS is a complete operating environment with applications, management, and the user interface, PaaS provides virtual machines, operating systems, applications, Services , development frameworks, transactions, and control structures.

1.1 Benefits of cloud computing.

Self-service provisioning: End users can spin up computing resources for almost any type of workload on-demand.

Elasticity: Companies can scale up as computing needs increase and then scale down again as demand decrease.

Pay per use: Computing resources are measured at a granular level, allowing users to pay only for the resources and workloads they use.

2. RESOURCE ALLOCATION.

Resource management is one of the key topic of cloud computing. It includes following issues Resource provisioning, Resource allocation, Resource adaption, resource mapping, resource modelling, Resource allocation has a significant impact in cloud computing, especially in pay-per-use deployments where the number of resources are charged for application providers. The issue here is to allocate proper resources to perform the complete task with minimal time and infrastructure cost. In cloud platforms, resource allocation takes place at two levels. First, when an application is uploaded to the cloud, the load balancer assigns the requested instances to physical computers, attempting to balance the computational load of multiple applications across physical computers. VM allocation and task scheduling for cloud is a three folded problem which requires: (1) to decide when a VM should be allocated (2) allocating an appropriate physical machine (PM) for it - a problem related to bin packing and (3) scheduling tasks on the VM depending on various client and application given objectives.

The order and time of allocation of resources are also an input for an optimal RAS. RAS should avoid the following criteria as follows:

a) Resource contention situation is when two applications try to access the same resource at the same time.
b) Scarcity of resources is when there are limited resources.
c) Resource fragmentation situation is when the resources are isolated. There will be enough resources but not able to allocate to the needed application.
d) Over-provisioning of resources is when the application gets surplus resources than the demanded one.

Resource users estimates of resource demands to complete a task before the estimated time may lead to an over-provisioning of resources. Resource providers's resource allocation may lead to an under-provisioning of resources.

3. EXISTING WORK.

In Existing work author use PBIL algorithm for resource better utilization.PBIL algorithm is form of EDA (Estimation of distribution algorithm). EDA use the characteristic of genetic algorithm. In genetic algorithm crossover and mutation steps are perform and Sometime that give not better solution, so EDA is use for resource allocation. Hear no use of crossover and mutation like GA. In EDA initial population are generate and this is based on them select the individual, and then find their fitness and based on their fitness probability is updated.

In paper PBIL work on initial population. Based on initial population hear first resource(VM) allocation matrix is created. This model created based on probability value. After that hear create ETC matrix. ETC matrix is created using MIPS value of VM and MI value of Task. Use of this two matrix fitness of resources is find. Hear fitness value is based on total execution time of resources for allocated task. And based on that fitness value resources scheduling order is decided. Using this resource order task is allocated to that resources based on resource allocation matrix. But hear during the task binding to VM not consider the priority of task. Its use first come first serve approach. But sometime higher priority task need to execute first.[3]. So,Solving this problem we using the Hungarian method in proposed system.

4. PROPOSED METHOD.

An assignment problem is a case of transportation problem where the objective is to assign a number of resources to an equal number of activities so as to minimize total cost or maximize total profit of allocation. In Propose system Hungarian method is used for resource allocation. Hungarian method is used for solving assignment problem. Hear in proposed method priority of task is considered in term of length of the task. Longer task need to highly efficient resources so,the execution time of all resources are balance. And total execution time are also reduced. Hungarian method is mathematical method and its developed by Hungarian mathematician. D.konig. Its used for solving assignment problem. The main objective of this method is give the optimal solution of the assignment problem. For Solving the assignment problem create one table based on the value of data. In our cloud computing system Solve assignment problem create one table based on the task and resource data. In table resource are represent in column and tasks who need resources that are represent in row. Using the basic step of the Hungarian method we proposed following algorithm step.

3.1 Algorithm step:

Input: Resources (VM) [i=1....n]
Task (T) [j=1....m]
Step 1: For all VM, Capacity of each VM
Vc[i] = VM Capacity in MIPS
Step 2 : For all Task, Length of each Task
TL[j] = Length of Request in MI
Step 3: Find Execution Time for each Request to VM
Ex_Time[i][j]= TL[j]/VC[i] Seconds
Step 4 : Construct Execution Time Matrix Ex[V,R].

//VM Selection Procedure
For that apply the step OF Hungarian method.

Step 5 : Find out Minimum Execution Time from each row and subtract it from entire row.
Step 6 : Find out Minimum Execution Time from each column and subtract it from entire column.
Step 7 : Cover number of zero with minimum line.
If , No.of zero = number of resources than go step 9,
Else,
go to step 8.
Step 8 : Find minimum value which is not covered by any row and column and Subtract it from uncovered row and add it from value which is twice covered by line.
Step 9 : Compare this matrix with original matrix and choose best resources.

3.2 Theoretical Analysis:

Table 1: VM and Task Specification

VM_Capacity in MIPS	Task_ Length in MI
100	9000
120	5000
125	3500
112	4500

Create Execution time for all task and VM.

Table 2 : ETC matrix

T/VM	VM_1	VM_2	VM_3	VM_4
T_1	90	75	40	80
T_2	35	30	28	37
T_3	50	41	40	45
T_4	45	37	36	40

Perform all Hungarian method step on this ETC matrix for obtaining optimal solution.

Table 3 : Final optimal Solution

T/VM	VM_1	VM_2	VM_3	VM_4
T_1	42	34	0	36
T_2	0	2	1	4
T_3	2	0	0	1
T_4	1	0	0	0

Compare this optimal solution with original ETC matrix.

Table 4 : Compare with original matrix.

T/VM	VM_1	VM_2	VM_3	VM_4
T_1	90	75	40	80
T_2	35	30	28	37
T_3	50	41	40	45
T_4	45	37	36	40

Hear show in the table 4 final solution of VM allocation. Highlighted value in table show the final solution.
Total execution Time of this example is = 40+35+41+40=156 s

4. EXPERIMENTAL RESULTS

CloudSim is used in this paper to implement and simulate the proposed approach in cloud environment. Performance of proposed approach is than compare with Existing PBIL algorithm in terms of Total Execution Time. This research work considers Datacenter, VM, host and Cloudlet components from CloudSim for implementation of a proposed algorithm. Datacenter component handles service requests. VM consist of application elements which are connected with these requests, so Datacenters host should allocate VM requested by user.

In Simulation experiment, we tested above both Base paper and Proposed Work with
4 random generated tasks and virtual machines respectively. The simulated parameters are set as follows.
1) To set Virtual Machines according to the Processor is limited in [500,2000] MIPS; bandwidth is 10 Mbps; Storage is 512 MBPS.
2) To create cloudlet according to the task length which is random between [20000,80000].

Table 5 : The comparison of the totaltime of the simulation scenario.

Algorithm	Cloudlet	Execution Time(ms)
PBIL algorithm	4	918
Hungarian Algorithm	4	678

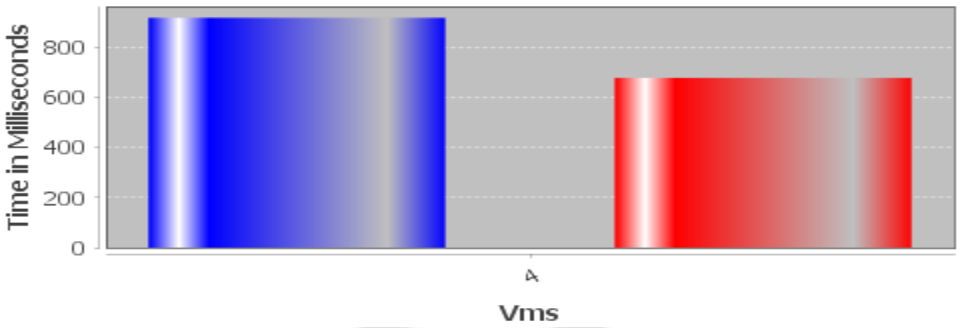

Chart 1: Execution Time comparison using 4 Cloudlet on 4 VM.

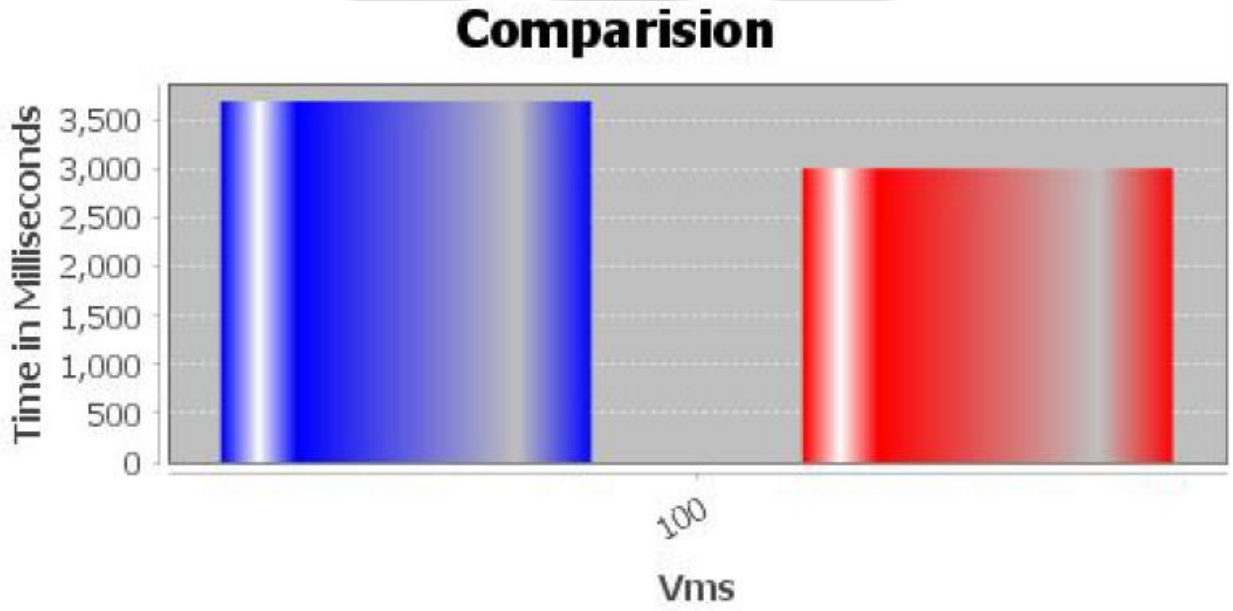

Chart 2: Execution time comparison of 100 Task on 100 VM.

5. CONCLUSIONS.

Hear we showing In existing Work PBIL algorithm is proposed for resource scheduling. In this algorithm firstly resource allocation model and ETC matrix is generate and based on that algorithm scheduler know about which task have to schedule by which VM. In this algorithm no relation between length of task and VM speed, hear VM allocate to task synchronously. Priority of task is not considered during VM allocation, so there is possibility of task having higher priority need to be scheduled first then other. So in proposed system we show Hungarian method for solving that problem. Using Hungarian method we can able to show resource allocation for available jobs using data. Also Hungarian method is simple to implement and works in balanced as well as unbalanced condition. And time comparison in experimental result.

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