

A Hybrid Heuristic Scheduling Algorithm in Cloud Computing

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ABSTRACT

In cloud computing tasks scheduling problem is NP-hard, furthermore it does onerous for attaining an optimum resolution. Extremely quick optimization algorithms are used to approximate the optimum resolution, like ACO (ant colony optimization) algorithm. In cloud computing, in consideration to solve the problem of task scheduling, a period ACO (PACO)-based arranging algorithmic rule has been used. This algorithm uses is related to ant colony optimization in cloud Environment. Experiments performed by using PACO exhibit fine achievement both in load balance and make span of the entire cloud cluster. In this paper different technique such as ACO, PACO, min-min for task scheduling problem and determining optimal solution are deliberated.

Keywords: cloud computing; NP-hard; PACO; Scheduling; ACO; Min-Min; PSO.

I. INTRODUCTION

Cloud computing becomes as focal point solely during understand around what IT regularly demands, a system to increment capability or by adding efficiencies on the speed beyond spending in updated practicing recent organization, approving fresh software or infrastructure [1]. Cloud computing encloses several contribution-based or reward according to usage employment, in actual period above the Internet, enhance IT's current functionalities. Cloud Computing has develops into as extensible benefits implementation and deliverance stand in the region of various managements computing. Technically, Cloud Computing contains Service-Oriented Architecture (SOA) [2] and Virtualizations of hardware and software. The main purpose of Cloud Computing is to contribute benefits between various cloud partners, cloud vendors and cloud service consumers in the cloud cycle. The assets circulating at many different layer outcomes in different cloud resources like framework hardware, managing IT framework, software cloud like SaaS concentrating on middleware as a management, application cloud such as UML modelling tools as a management, Application as a management, communal network as a management, and trade cloud for e.g. profession that operate as a management. Cloud computing is the updated and most recent attempt in transferring computing assets as a management which shows a move aside from computing as a output which is acquired to computing as a management which are forwarded to purchaser above the cyberspace from extensive information clouds. Although cloud computing has soaring demand in the IT management, academia emerged to be lacking back the brisk evolutions in this region. Structured along the specialized features on the cloud schedule from linked techniques, leads in the establishment of various compounds, protocols and ideal methods for constructing and designing clouds and fresh use-cases originating about cloud computing

Cloud Sim

Cloud computing consists of sharing of stable, safe, error- liberal, continual, and extensible frameworks for handling Internet- based function managements and each application have distinct arrangements, structure, and formation requisites. For measuring the achievement of arranging and distribution of data on cloud

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framework for various applications, employment models changing load, efficiency achievement and system length is a greatly difficult issue to handle. To ease this method a recent generalized and flexible imitation scheme is introduced which allows smooth manufacturing and instantiation of large scale cloud computing infrastructure and administration of benefits known as Cloudsim. Cloudsim includes:

- (a) Information centres on a one-sided natural computing joint and java virtual apparatus.
- (b) Possibility of virtualization appliance for formation and alertness of numerous, separated and co-hosted virtualized aids.
- (c) A self contained stand for modelling data centres, utility agent and other schemes.
- (d) Adaptability to switch among space-shared and time-shared allotment of handling origins to virtualized benefits.

1.1 ACO (Ant Colony Optimization)

Ant Colony Optimization is a kind of calculations, whose first part is known as 'Ant System'. At first ACO was planned by Marco Dorigo in 1992. The initial algorithmic rule aims to examine for an optimum way in a chart, on the basis of the behaviour of ants searching a way among their community and a origin of food. The essential hidden thought, imprecisely propelled by the conduct of authentic exact ants, is that of a lateral examination above certain invaluable estimation strings of within issue information and on an element memory structure consisting of data on the nature of already attained result.

1.2. PSO (Particle Swarm Optimization)

Particle Swarm Optimization is formerly ascribed to Kennedy, Shi and Eberhart. PSO was first predetermined for reflecting the social behaviour, say portrayal of activity of organisms in a flock of bird or fish school. PSO was made simple and was appeared to attain optimization and also applied on optimization issues that are partly not regular, vary over time, noisy, and so forth.

This approach is a computing technique which optimizes a complication repetitively demanding for improving a resolution with commendations to an apt portion of characteristics. PSO optimizes a complication by obtaining a populace of resolutions, where designated pieces and active such dubbed pieces around the search-space in accordance with smooth numerical formulas above the location and speed of atoms. The evolution of each particle is affected and altered by its most excellent common location. Although, it is too directed approaching the most excellent positions common in the search-space, that are amended as excelling locations initiate by another atoms. This is anticipated for moving the swarm at the finest resolutions.

1.3. PACO (Period ACO)

PACO uses ant colony optimization algorithmic rule in cloud computing, with the initial planned arranging time method and the development of essence severity update method. PACO has a fine achievement both in make span and load equilibrium of the whole cloud environment. In cloud computing, the various assets have distinct efficiency to operating the efforts that point to the dissimilarity of the original essence severity on every asset. And the duty of efforts should be adapted consistent to the actual period efficiency of assets and the alteration of load. So it is essential to compose a few developments to the ant community algorithmic rule to achieve improved achievement in cloud computing assignment arrangement.

1.4. GA (Genetic algorithm)

Genetic algorithmic rule is an unplanned seeking approach enhanced from the expansion standard in environmental globe (the inherited system of endurance of the suitable). It has private certain similarity and

improved additional capacity. By the expansion procedure of expectations, it may be naturally access and guide the enhanced seeking region and adapt the seeking direction by itself. Whereas the VM assets arrangement in cloud computing atmosphere and with the improvement of genetic algorithmic rule, this paper shows an equalized arranging scheme of VM assets related to genetic algorithm.

1.5. BFO (Bacterial Foraging Optimization)

Bacterial foraging optimization algorithm (BFOA) has been wide preferred in the act of world improvement algorithmic program of present significance for scattered improvement and management. BFOA is impressed by the common forage conduct of *Escherichia coli*. Down we shortly explain the 4 leading steps in BFO.

(i) Chemotaxis: This method pretends the activity of an *E.coli* cell.

$$\theta^i(j+1, k, l) = \theta^i(j, k, l) + C(i) \frac{\Delta(i)}{\sqrt{\Delta^t(i) \Delta(i)}}$$

Here Δ specifies a vector in the arbitrary direction whose fundamentals lie in [-1, 1].

(ii) Swarming: A stimulating cluster conduct has been discovered for many movable species of bacterium as well as *E.coli* and *S. typhimurium*.

$$J_{cc}(\theta, P(j, k, l)) = \sum_{i=0}^s J_{cc}(\theta, \theta^i(j, k, l))$$

where $J_{cc}(\theta, P(j, k, l))$ is the desired purpose value to be combined to the exact desired purpose.

(iii) Reproduction: The smallest healthy microorganism eventually dies whereas every of the better microorganism (those admitting minor worth of the target behavior) asexually divide into two microorganisms that are then located between the similar position. This attains the swarm length consistent.

(iv) Elimination and Dispersal: Gradual or rapid changes within the native surroundings wherever a bacteria inhabitants lives could occur because of varied reasons e.g. a major native increase in temperature could kill a class of bacteria that are presently in a very area with a high absorption of nutrient gradients.

1.6. BFPSO (Bacterial Foraging Particle Swarm Optimization)

The hybrid approach of two heuristic optimization algorithms becomes Bacterial Foraging Particle Swarm Optimization. BFPSO is used to reduce the makespan in Cloud environment. This is a new approach. One of the most important scheming services of BFO algorithm is the chemotactic progress of a bacterium that model a experiment result. It gives batter results then Particle Swarm Optimization algorithm and Bacterial Foraging.

II. LITERATURE REVIEW

This block described the research work that has been done in recent years. Image compression is the ultimate favourable field of research in which assemble the interest of all analysts. A literature review goes beyond the inquiry of report or knowledge and it relates the recognition and connection of relationships among the literature and research field.

Lizheng [14] discuss about the virtualization in cloud computing and its performance measures. Currently, most of the efforts have been taken to develop and design various Cloud technologies based upon novel methods, mechanisms and policies for managing of Cloud infrastructure efficiently.

Lin [15] work differs by displaying the readying of a huge capacity function on numerous cloud computing stages over a cloud computing foundation. They additionally assign pointers for the look, employment, and

description of cloud computing foundation during this work. There have additionally been several tasks in planning and replacing bio-molecular functions to scattered computing surroundings.

Yadav et al. [21] discusses the energy preservation and fault tolerance in cloud computing, an unified assignment arranging algorithm that obtains towards account the problem like VM management and Data center management.

Rakesh et al [22] planned a hybrid function arranging algorithm which is related to connecting the positive points of bio-inspired algorithms such as Ant Colony Optimization and Artificial Bee Algorithm.

Banerjee et al [23] emphasize an intelligent career distribution approach for a CSP by utilize Round-Robin (RR) scheduling policy.

Wu et al. [24] proposes assemble diagnostic pictures to evaluate the system capability of systematic plans applying cloud-based computing assets, and initiate a effort arranging complication to lessen the system along suspension underneath a user-defined economic force.

In [25], *Rui et al.* achieved a cost-based arranging development via system assignment separation and due date responsibility to apt a user-defined due date with the least worth. The system assignments are 1st classified into simultaneous occurrence assignments and clear assignments according to the range of the parent and child assignments. Mutually dependent elementary assignments that are accomplished regularly are then composite into sections associated by simultaneous occurrence assignments.

In [26], *Zhu et al.* examined the automated scaling of clouds with total amount and due date pressure and suggested Scaling-Consolidation- Scheduling (SCS) with VMs as fundamental computing aspects.

In [27], *Seungmin et al.* construct a QoS-based system arranging algorithmic rule related to Partial Critical Paths (PCP) in SaaS clouds to lessen the worth of system accomplishment among user-defined time limit. As various current demanding-way heuristics, they arrange curriculum on the demanding way initially to lessen the worth beyond expanding their time limit. PCP is then developed closure at those arranged curriculums, and every PCP holds the beginning period of the arranged demanding curriculum as its due date. This arranging method repeats recursively till entire curriculum are arranged.

III. METHODOLOGY

The methodology is defined as the steps followed for performing the proposed research work. The new way is planned for VM position that can efficiently resolves the issues for reduce the respond time, reduce the payload, and balance source employment.

Latest work solved some problems:

- a) Improve Network Intermission
- b) Improve Operations
- c) Improve the recovery scheme from record

With this new approach the hosts are categorized based on the source opportunity. Commonly there are three kinds of ability specifications of all systems i.e. CPU, B/W and Memory. However after allotment a huge number of sources wait underutilized. The approach expresses the total waiting sources is assembled and is allot to further appeal. Assume that when appeal for VM appears to scheduler point the VM on the satisfactory host in the account in which every host have resting source capability in order. With these results able to take decision for allocating of workload. It means that the vm that has least response time will be allocated the workload rather than the one with more response time.

STEP 1: In this step the Data Center are created in Cloud Sim.

STEP 2: In the next step the Virtual Machine are created.

STEP 3: In this step, GA algorithm is initialized.

STEP 4: The BFO algorithm is initialized and find the Makespan with it.

STEP 5: In this step apply the hybrid of PSO and BFO

STEP 6: BFPSO help to reduce the Makespan.Comparison between GA and BFPSO

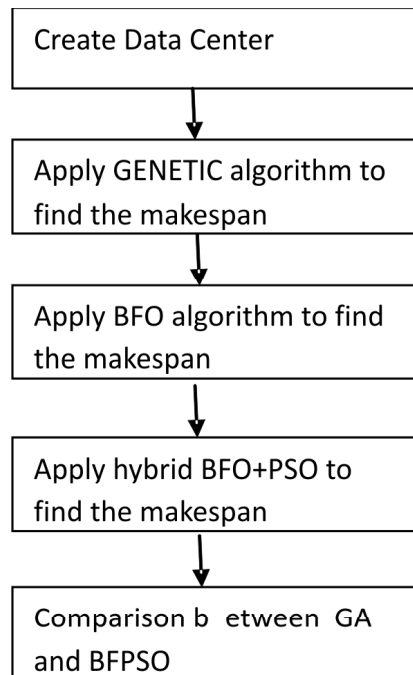


Figure 3.1: Flowchart of Methodology

IV. EXPERIMENTAL RESULTS

We consider only one datacenter per service provider, even though it can be simple to extend multiple datacentres in service provider. For simplicity, we assume that the physical servers in datacenters are of

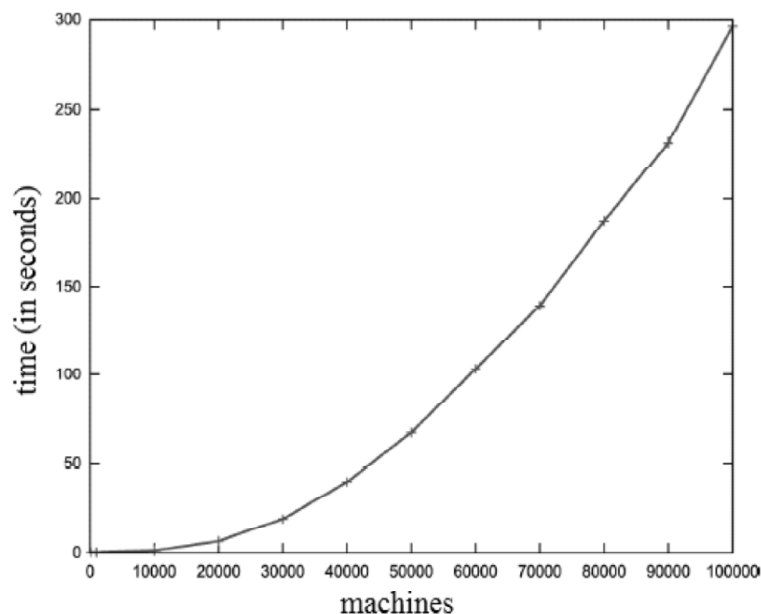


Figure 4.1: Memory Usage in Resource Instantiation

similar pattern and have the capability of running the same number of VM instances. This work is done in Cloud Sim tool. Table show the configuration of cloud configuration which consists of virtual machines. We tend to model the user (thro' the Data centre Broker) to appeal formation of fifty VMs having following constraints.

Figure 4.1 and 4.2 represents task units' progress status with growth in reproduction steps between the time.

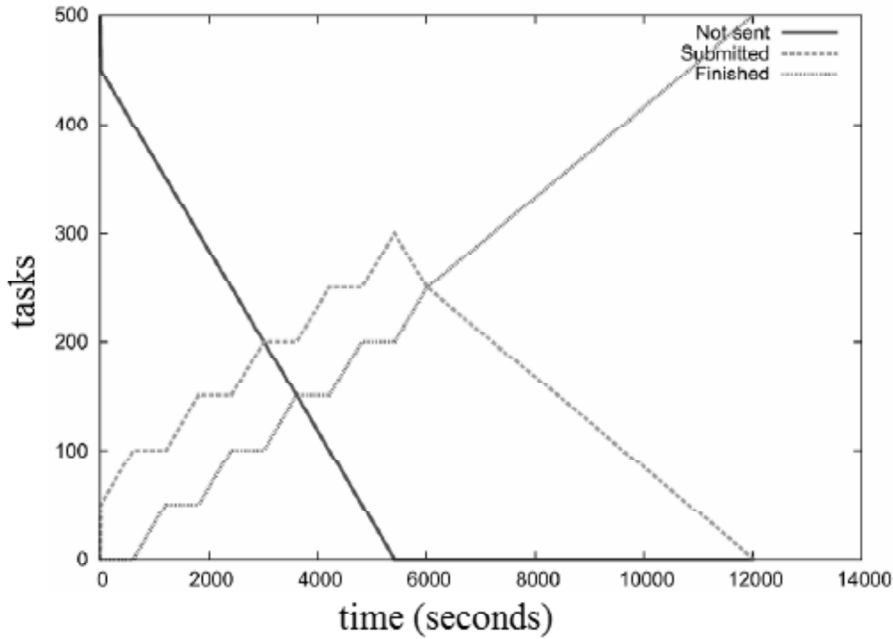


Figure 4.2: Task Execution with Space-Shared Scheduling of Tasks

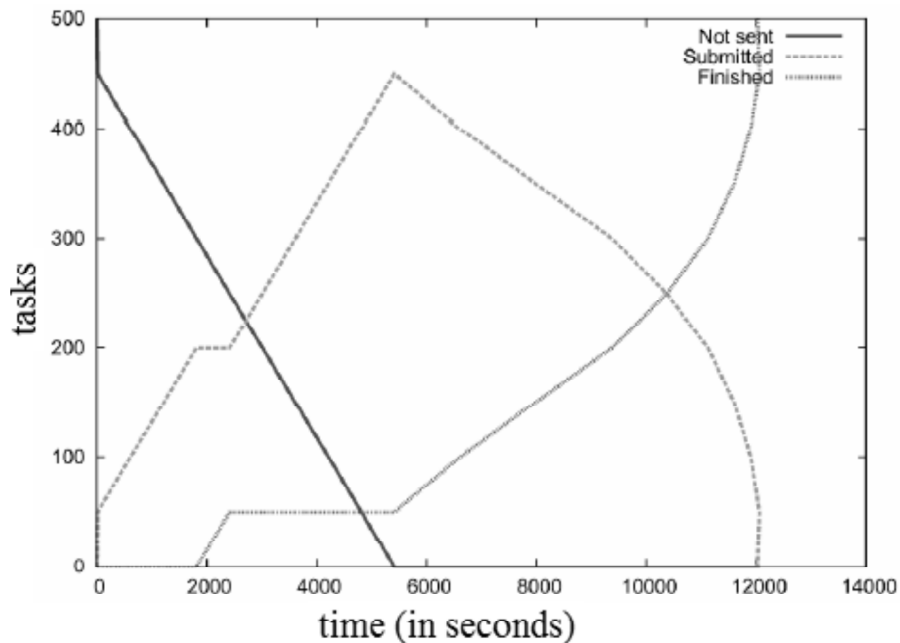


Figure 4.3: Task Execution at different level of time

In figure 4.3 a snapshot is present where the intermediate calculation of results is being shown and in figure 14, a snapshot is present where a final result is obtained and on basis of these results we can evaluate that the latency of dissimilar positions have various impact on the ability of workload further if we move at

the Probability distributive function (PDF) at Figure 4 and 5 we can see that the values at which the different strategies are working and the output is coming.

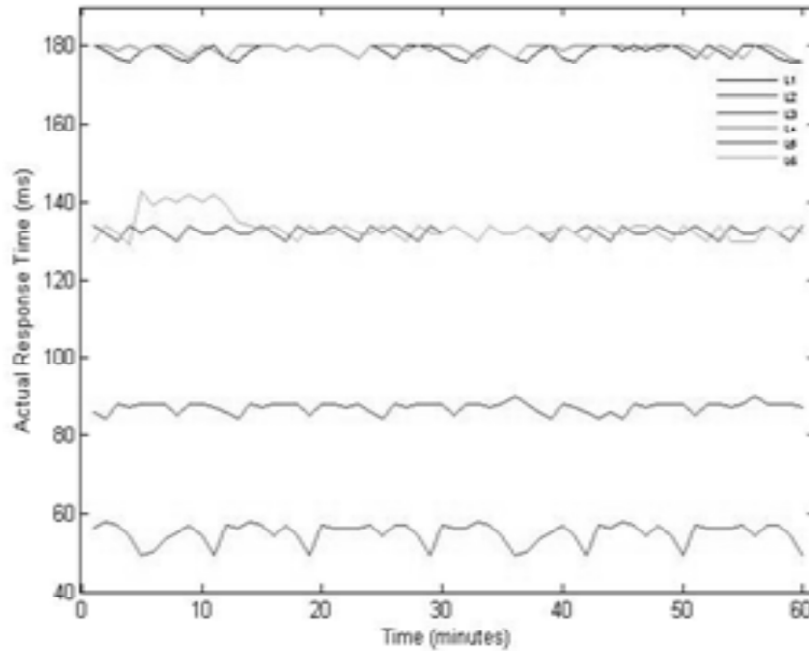


Figure 4.4: Latency at different Locations (ms)

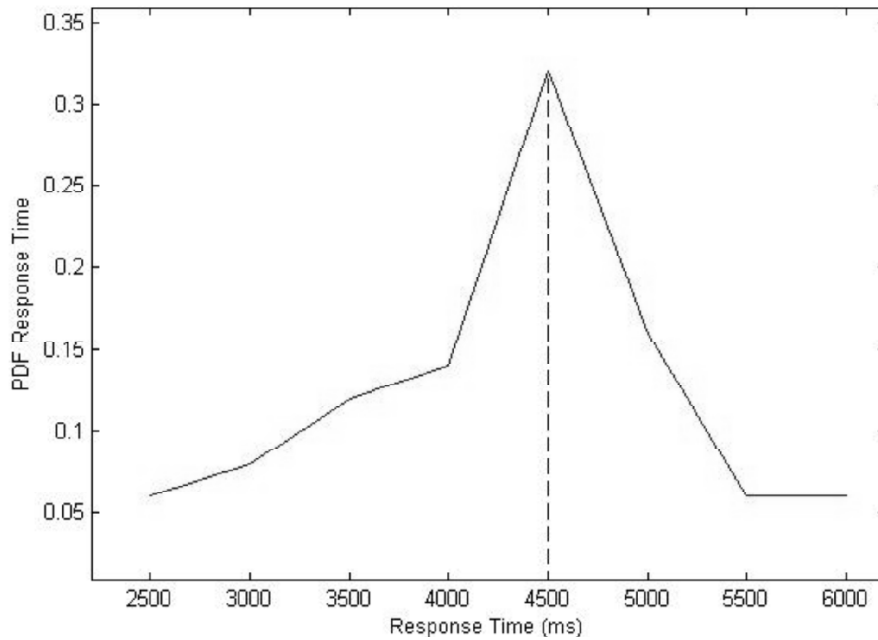


Figure 4.5: Probability distributive Function of Response Time

Table 1
Experiments Result
Comparison of Finish Time between Algorithms

<i>Algorithms</i>	<i>Finish Time</i>
GA	154.05
BFO	85.31
BFPSO	32.2

	GA	BFO	BFPSO
Finish Time	154.0500	85.3100	32.2000

Figure 4.6: Comparison of Finish Time between GA ,BFO and BFPSO

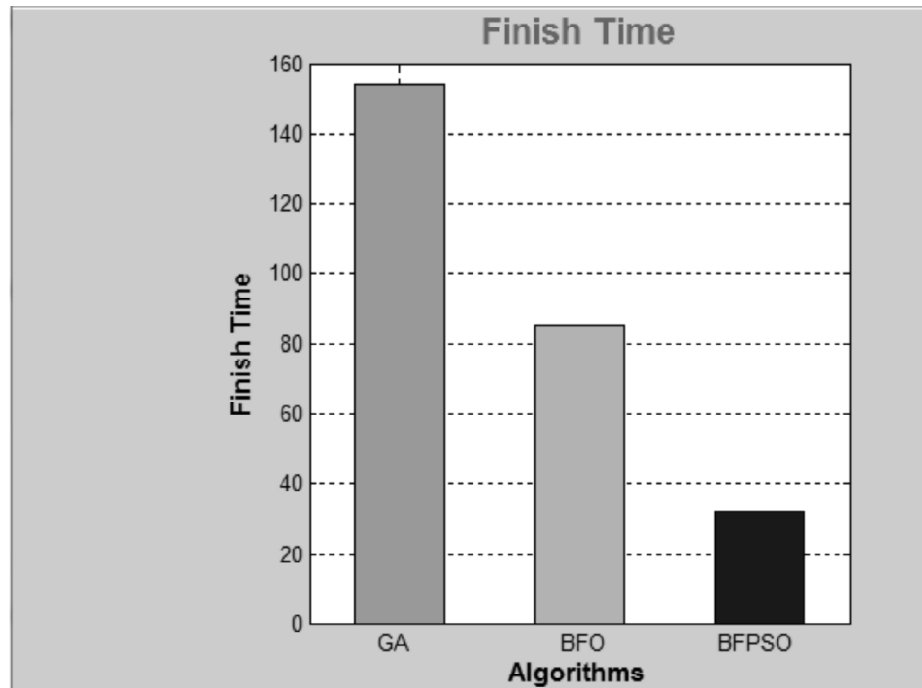


Figure 4.7: Graph of comparison of GA , BFO and BFPSO

V. CONCLUSION

In this work, we have discussed about the optimizing the performance to the different VMs inside a Cloud Data Center with the help of the mape k loop, which is a classical scheduling policy. It is a part of our whole work. It helps to map the jobs to the appropriate VMs, which will reduce the overall response time of the jobs and with the introduction of worst case algorithm we observe a further improvement in performance. A system has been developed in that way of method that will support the bore to analyze brilliantly that how lots of jobs might be furnished by a one VM at a assured moment stamp. That resolves upgrade the totals make span of the Cloud Service source.

Just as planned algorithms are figure out by using the Cloud Sim simulator toolkit. Extremely lope time trial can be determined by the suggested algorithms in cloud Sim atmosphere. The new recommended scheduling algorithm VM relocation approach is not measured for underneath appropriate host or over appropriate host. The appraisal for the reaction moment, stability utilizes of resources of a host and load allocation on all the hosts is based on the VM forecast mode. So using the relocation approach for under appropriate host and over appropriate host that can provides the quantifiable development for load balancing and can also arrange the slave concentration.

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