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A Hybrid Technique Using Genetic Algorithm and ANT Colony Optimization for Improving in Cloud Datacenter

Mandeep Kaur[1*], Manoj Agnihotri[2]

[1,2] Dept. of CSE &Amritsar College of Engineering and Technology, Manawala Amritsar, Punjab, INDIA

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Abstract— Cloud computing is becoming popular day by day, due to its wide range of applications. As demand of cloud computing is increasing, it increases the number of request too. Thus providing high availability to its user is a challenging task. So load balancing techniques become good alternative of these techniques. In optimization issue, Genetic Algorithm (GA) and Ant Colony Optimization Algorithm (ACO) have already been referred to as excellent option method. GA is created by adopting the organic progress process, while ACO is encouraged by the foraging behavior of ant species. That paper has offered a hybrid GAACO based scheduling technique to improve the load balancing further. In this technique, GA can view and maintain the fittest ant in each period in most era and just unvisited spots will be evaluated by ACO. The overall objective of this paper is proposes hybrid GA-ACO based analytical model to enhance the results further.

Keywords— Cloud Computing, Load Balancing, Ant colony optimization, and Genetic algorithm

I. INTRODUCTION

Cloud computing is the most newest popular paradigm encouraging to show the perspective of "computing Utilities" into fact, it gives a flexible and simple way to store and retrieve large data without worrying in regards to the equipment needed. As how many people on cloud increases, the existing resources reduces quickly which leads to the issue of delay between the people and the cloud support providers. Cloud computing is popular technology which is a new typical of large degree distributed computing and similar computing. It offers provided resources, data, software deals and other resources depending on client demands at specific time. As cloud computing keeps growing quickly and more people are attracted towards utility computing, better and fast support must be provided. The distributed pcs give on-demand services. Solutions could also be of offer resources (e.g. offer as a Service) or bodily resources or hardware/infrastructure (e.g. Hardware as a Support or Infrastructure as a Service). Amazon EC2 (Amazon Flexible compute Cloud) is connect exemplary case of cloud computing services. As cloud computing is in their growing stage, thus there are numerous issues current in cloud computing. Such as for example:

- Ensuring correct accessibility management (authentication, authorization, and auditing)
- System stage migration, so as that it wants minimum price and time to control employment.
- To offer correct security to the info in transit and to the info at rest.

Figure1. Cloud computing

A. *LOAD BALANCING*

Load balancing is also a start research region in cloud datacenter. Several recent studies have already been published. Load balancing is the procedure of redistributing

the machine workload among all running nodes in a spread program in order to increase equally resource operation and response time and also to avoid a situation, wherever some nodes (physical servers) are overloaded while other nodes are lazy or under-loaded. Establishing a highly effective dynamic load balancing algorithm for cloud conditions may result in sustaining the system's balance and availability. There are lots of load controlling Bio-inspired methods like Genetic Algorithm, Ant Colony Optimization, Chemical Swam Optimization such like which can be accustomed to balance the load [7].

1) Classification in keeping with the Program Load

a) Centralized approach: In this approach, a single node is responsible for managing the distribution within the whole system.

b) Distributed approach: throughout this process, every node severally develops its own load vector by selection the load data of substitute nodes. Decisions are made locally using local load vectors. This method is a lot of appropriate for widely distributed techniques like cloud computing.

c) Blended approach: a mixture involving the two techniques to require benefit of each approach.

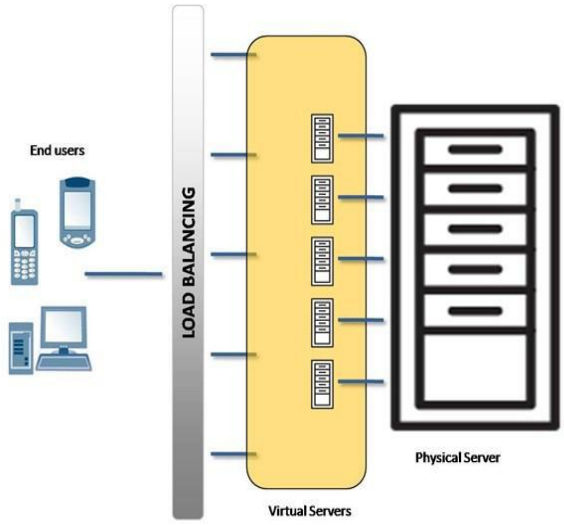

Figure2. Load balancing

B. TASK SCHEDULING [7]

The task scheduling refers to distinguishing the order in which the responsibilities are picked by operating system for execution. Task Scheduler is needed within knowledge stores to prepare task executions. Task arrangement in a cloud computing may be described as a NP-hard concern that comprises of x jobs with y machines. Every task should be prepared through one of the y models bearing in mind the finish goal to reduce make span. Arrangement formulas are use mainly to reduce delivery time in addition to delivery cost. Task scheduling manages the issue which sources involve to allocate to the obtained job. A successful scheduling algorithm concentrates on load managing in the device along with the delivery time of accessible resources. It diminishes the delivery time that results in reduce the delivery cost. To perform each one of these objectives, the key theory is not throw away high-capacity sources upon minimal period jobs. The scheduler allocates sources to the jobs depending on the job needs and accessible sources capacities.

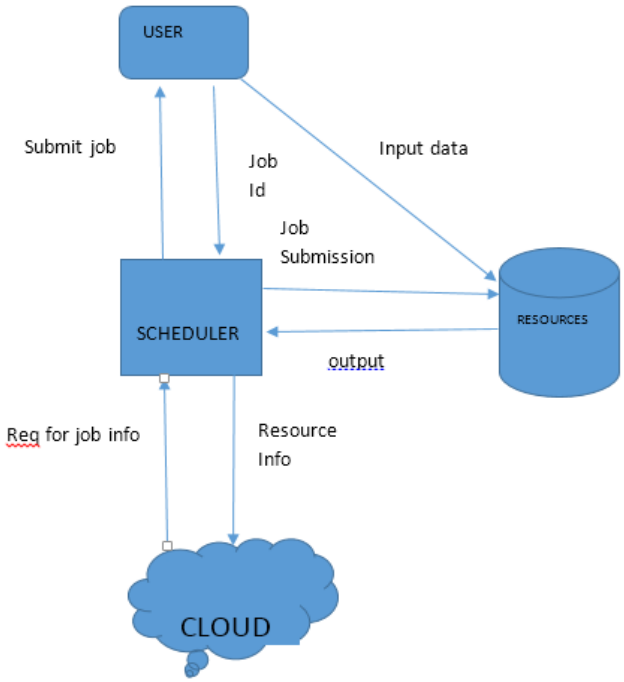

Figure3. Task scheduling in cloud computing

This paper is organized as follows. At first, Section 1 contains the introduction of the cloud computing, load balancing and Task scheduling. Section 2 focus related work on techniques used in cloud datacenter. Section 3 introduces the problem formulation which we can find in existing work. Section 4 describes the technique which is used in the proposed work and their model and explains the methodology with flow Chart. At the end, the finding is concludes research work with future direction by improving the values of parameters.

II. RELATED WORK

Santanu Dam et.al Genetic Algorithm and Gravitational Emulation Based Hybrid Load Balancing Strategy in Cloud Computing (2015) [3].

This paper presents an algorithm for fixing load handling issue among VMs through a variety of a genetic algorithm (GA) and gravitational emulation local search (GEL). GA has worldwide character towards the situation space wherever GELS queries locally. Simply the proposed algorithm attempts to minimizing the produce span along with reduce the number of VMs who are likely to miss their deadlines. Though GEL algorithm use some arbitrary aspects that doesn't shift always one of them in the same way for this reason it doesn't stop always with perfect solution. Cloud Analyst used as a simulation instrument for the proposed fill handling strategy. Experimental results of the trial program are very really encouraging. Somewhat the outcome of the proposed algorithm are compared and outperformed the standard strategy like First Come First Serve(FCFS), local search algorithm like Stochastic Slope Climbing(SHC) and smooth processing approaches like Genetic Algorithm (GA) and Ant Colony Optimization(ACO).

C. Y. Liu; Dept. of Inf. Eng. et.al A Task Scheduling Algorithm Based on Genetic Algorithm and Ant Colony Optimization in Cloud Computing (2014) [7].

This report planned a task agreement algorithm predicated on genetic-ant colony algorithm. He got the benefit of powerful positive feedback of ant colony optimization (ACO) on convergence rate of the algorithm in to account. But the choice of the first pheromone has a crucial impact on the convergence rate. The algorithm utilizes the global research power of genetic algorithm to resolve the suitable answer quickly, and then turns it into the unique pheromone of ACO. The simulation tests reveal that beneath the same circumstances, that algorithm overweighs genetic algorithm and ACO also offers performance gain in large-scale environments. It is a successful task agreement algorithm in the cloud computing environment.

Kousik Dasgupta et.al A Genetic Algorithm (GA) based Load Balancing Strategy for Cloud Computing (2013) [10].

This paper proposed a load balancing strategy using Genetic Algorithm (GA). The algorithm thrives to balance the load of the cloud infrastructure while trying minimizing the make span of a given tasks set. Load balancing which can be one of several major difficulties in Cloud research, directs the energetic workload across numerous nodes to make sure no single resource is possibly confused or underutilized. This can be viewed as an optimization problem and a good load balancer should adapt its strategy to the changing environment and the types of tasks. The proposed load balancing strategy has been simulated using the Cloud Analyst simulator. Simulation results for a typical sample application shows that the proposed algorithm outperformed the existing approaches like First Come First Serve (FCFS), Round Robin (RR) and a local search algorithm Stochastic Hill Climbing (SHC).

Jianhua Gu, et.al A New Resource Scheduling Strategy Based on Genetic Algorithm in Cloud Computing Environment (2012) [11].

This report provides in change charge to spell it out the strain change of process digital machines, and additionally it presents normal load distance to evaluate the typical load handling aftereffect of the algorithm. The try shows that strategy has decent global astringency and efficiency, and the algorithm with this report is, to a good level, prepared to eliminate the difficulties of load difference and large migration value after process VM being scheduled. Yet in real cloud computing setting, there may be powerful change in VMs, and there also may be a growth of computing value of virtualization computer application and some unpredicted load wastage with the raise of VM quantity started on every physical machine.

K. Zhu ; Sch. of Eng. & Comput. Sci et.al. Hybrid Genetic Algorithm for Cloud Computing Applications (2011) [13].

This report present suggestions the implementation of load balancing in cloud processing is currently complex and it is difficult to achieve. Multi-agent genetic algorithm (MAGA) is a combination algorithm of GA, whose effectiveness is much superior compared to that of the normal GA. That report reveals the key advantage of MAGA over conventional GA, and then exploits multi-agent genetic calculations to correct any danger of strain handling issue in cloud processing, by preparing a whole lot handling type on the building blocks of virtualization guide management. Ultimately, by assessing MAGA with Small technique, the test benefits show that MAGA has the capability to obtain better effectiveness of load balancing.

III. PROBLEM FORMULATION

Load balancing of resources across virtual machines is the fundamental problem in the Cloud data center. GAs is used as an optimization technique in several practical problems, due to its capacity to locate the global maximum in a multimodal landscape. The genetic algorithm (GA) does not guarantee global optimization solution.[6] However one may use ant colony optimization strategy of genetic algorithm (GA) but ant colony suffers from poor converge speed. We will use hybrid approach using ant colony optimization (ACO) and genetic algorithm (GA) adopted with multi-objective function which is ignored in the previous work. [6] Therefore to improve above limitations a multi-objective hybrid genetic algorithm-ant colony optimization (GAACO) will be proposed.

IV. TECHNIQUE

A. Genetic Algorithm (GA)

Genetic methods are a form of ideal search methods which replicate scientific evolution and natural selection in organism, which uses the series as generating the initial population, evaluation, selection, crossover, mutation, and regeneration. Genetic Algorithm is used for reducing the scheduling time. In addition, it a used as the technique of scheduling in which the jobs are assigned sources according schedules in context of scheduling, which tells about which source will be assigned to which task[6]. The idea of GA is that the modern generation of solution must be better compared to the previous one.GA represents a solution to the problem as a genome (chromosome).

B. Ant Colony Optimization (ACO)

Ant Colony Optimization (ACO) is really a computational process that's influenced from the method by which of ant colony seeking the smallest trip from the meals mention of the home without aesthetic aid. Within their exploring, bugs deposit a volume of pheromone while strolling to produce a stage and communication with other ants. Those who couldn't scent the pheromone, they hold travelling at arbitrary route. The pheromones of particular journey are increasing when more bugs are well tracking about this to acquire the shortest one. ACO methods are useful for solving discrete optimization problems that need to find paths to goal [5].

C. Hybridization of Genetic Algorithm Ant Colony Optimization

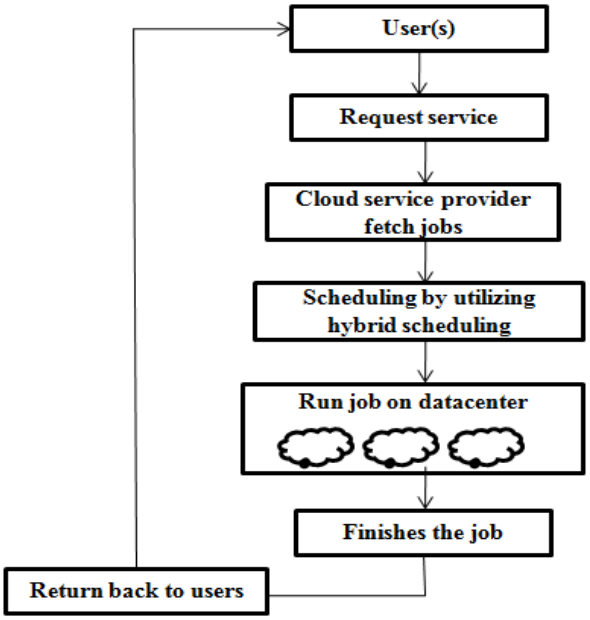

Figure4. Block diagram

The main strategy of this work is to define a way to hybridize GA and ACO to find solutions by combining specific steps of GA and ACO to propose GAACO. Hybridization can likewise be connected to a few variables and elements of GA or ACO that offer same attributes in the calculation, i.e. population size in GA and amount of ants in ACO, quantity of ages in GA and quantity of cycles in ACO, and chromosome in GA.

In this block diagram user send the request service then cloud service scheduling fetch the jobs, after schedule by utilizing hybrid scheduling. Run the jobs on datacenter result finishes the job. If jobs are not finish then back to user.

D. Flowchart

In the experiment, the performance of the proposed hybrid method is compared to the basic methods, both GA and ACO.

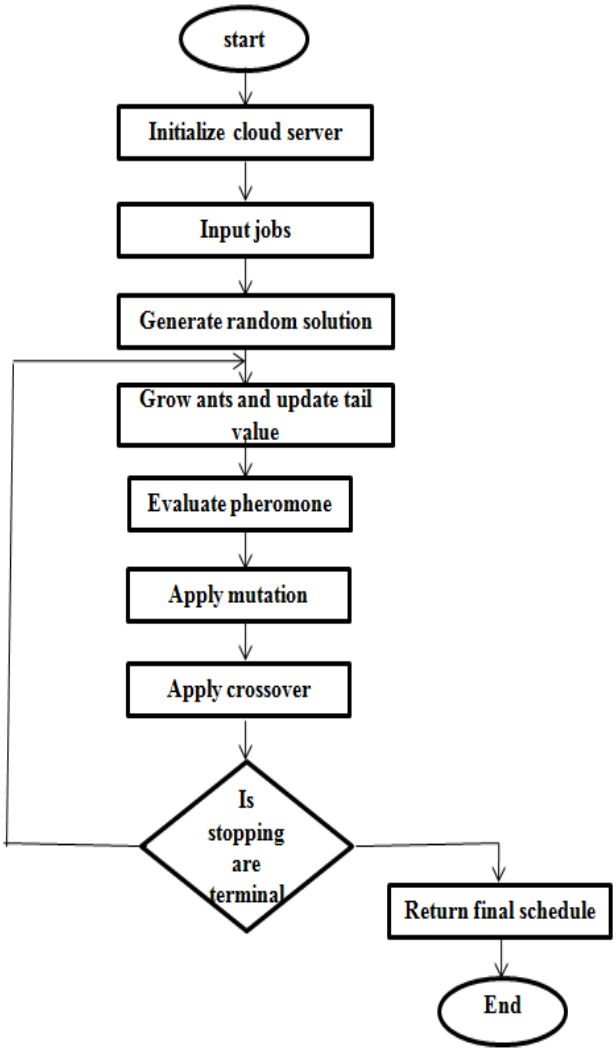

Figure5. Proposed approach

Step I: Start and Initialize cloud datacenter

Step II: After initializing, input the jobs in cloud datacenter.

Step III: Generate the random solutions for different parameters (Total running point Average running time job, Load of every node, Make spans of time, Overheads).

Step IV: Explore grow ants and update tail of ACO value.

Step V: Evaluate the pheromone in GA (ant's communication of each ant to improve the search performance).In this case pheromone trail-based method, which utilizes both local (path length, adjacency relations) and global information to construct offspring.

Step VI: Apply the mutation operator is a local search which can effectively maintain the population.

Step VII: Apply the crossover operator produce new individual by substituting.

Step VII: If new solution is greater than best then update best with the new result and if stopping criteria met then return solution and end the process. If stopping criteria is not met then generate random solution again.

Step XI: If new solution is not greater than best then return result and end the process.

V. CONCLUSION

Load balancing of resources across virtual machines is the fundamental problem of Cloud Computing. GA is study search and optimization techniques in several practical issues, due to its capacity to locate the global maximum in a multimodal landscape. [8] But GA does not guarantee global optimization solution [9]. However one may use ant colony optimization strategy of GA, but ant colony suffers from poor converge speed. We will use hybridization of ACO and GA adopted with multi-objective function which is ignored in the existing work. Therefore to improve above limitations a multi-objective hybrid genetic algorithm-ant colony optimization (GAACO) is proposed in this paper.

However this work has not considered the implementation of the proposed technique. So in near future we will design and implement the proposed technique in suitable tool.

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Author Profile

Er.Mandeep Kaur pursed Bachelor of engineering From Sai institute of engineering and technology, Manawala, (ASR) India in 2014.She is currently Pursuing M.Tech in Department of Computer Science and Engineering From Amritsar Collage of Engineering and Technology (ASR), India. Her main research work focuses on Cloud computing .

Author Profile

Er.Manoj Agnihotri pursed bachelor of engineering From Beant Collage of Engineering and Technology ,Gurdaspur India in 2005 and Master of Technology from Guru Nanak Dev University ,Amritsar India in 2009.He is currently pursing PhD from I.K Gujarat Punjab Technical University And currently working as associate Professor in Department of Computer Science and Engineering at Amritsar Collage of Engineering and Technology ,India. He has 7.5 years of teaching Experience. His main research work focuses on cloud computing, computer Algorithm and Green computing.

