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Job Scheduling and Load Balancing In Cloud Computing Using Hacobee

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Abstract: *Cloud computing is an emerged architecture in recent times that tends to satisfy the inspiration of entrepreneurs and researches on IT industry. A recent adaptive algorithm, the proposed algorithm is a hybrid algorithm (HACOBEE) which is optimal solution for job scheduling among nodes in a dynamic cloud environment for that uses combination of two approaches i.e. Ant colony optimization and Bee colony approach for workloads distribution among nodes of a cloud. In ant colony(ACO), ants continuously update the pheromone table while moving forward and backward from nest to food source and vice versa. In Bee colony (BCO), bees help in searching food sources and best sources is found calculating the fitness value. In this proposed algorithm for used in load balancing and job scheduling in better response time. To combine Ant colony optimization and Bee colony optimization to establish an effective load balancing and efficient job scheduling algorithm can be implemented in cloud environment to ensure that all virtual machines are busy in their assigned jobs and none of the virtual machines are idle.*

Keywords: *Ant colony, Bee colony, cloud environment, HACOBEE, job scheduling, load balancing.*

I. Introduction

Hybrid bee colony algorithm for solving the flexible job scheduling problem (FJSP) with that criteria to minimize the maximum completion time (makespan). The Distributed Job Scheduling Problem (DJSP) deals with the assigning a jobs to modules geographically distributed a good operation for a job schedule of each modules. The objective is to minimize the global (makespan) over the entire place. The study for biology of an ant colony shows that its behaviour is highly structured. Knowing that the single ant has limited capacities (example a single ant is not capable of communicating directly with other ants about past experiences), it is curious to know how the ants co-operator so as to achieve such a complex and organised behaviour of the both or total colony.

II. Optimization Techniques For Load Balancing And Job Scheduling In Cloud Environment

There are many existing load balancing and job scheduling techniques used in dynamic cloud environment. Thereare two most popular load balancing and job scheduling techniques, which have been considered for proposed work.

1. Ant colony optimization
2. Bee colony optimization

2.1. JOB SCHEDULING IN CLOUD ENVIRONMENT

This section details algorithms to perform job scheduling explained by the behaviour of honey bee colony. The challenge is to adapt the self-organized behaviour of the colony for solving job scheduling problems. Job Scheduling aims at assigning jobs to datacenters in the cloud so that the execution time (makespan) of the overall tasks of jobs is minimized.

Another algorithm was introduced in [9] that are based on the reproduction method of bees which is referred to as marriage in bees' optimization algorithm. In the marriage in bees optimization algorithm it starts with randomly initialized the queen's genotype and then a heuristic is applying to improve the queen's genotype with that there are preserved the assumption that a queen is usually a good bee. Next, the set of mating–fighters is undertake by relatively to the queen's energy and speed. The queen then moves between different states (solutions) in the space and mates with the encountered drones according to probability criterion. In [8] Tasquia M. et al. proposed modified task scheduling algorithm that combines bees life algorithm and to obtain job scheduling optimization in cloud environment. With their algorithm the Bee life algorithm was used for the job scheduling and the greedy algorithm is used for random selection of a data Centre.

2.2. LOAD BALANCING IN CLOUD ENVIRONMENT

Linan Z. et al. [5] proposed Ant Colony Optimization algorithm to solve travelling salesman problem. Ant colony algorithm chooses the target path through the pheromone strength. This ant colony algorithm achieves QOS (Qualityof Service) requirement and shortest path. Thus ant colony algorithm gives more efficient result for calculating node distribution and load balancing

Load balancer implement type specific algorithms to make load balancing decisions. The decision determines to which remote server a new job is to be forwarded. Few of the algorithms for load balancing are studied in this section. Depending on system state, load balancing algorithms can be divided into two types as static and dynamic.

III. Combined Proposed (Hacobee) Algorithem

In our proposed Algorithms, the characteristics of two algorithms Ant Colony and Bee colony optimization are being utilized for distribution of loads among various nodes in cloud environment. The ACO and BCO algorithms execute simultaneously. In ACO, ants originate the head node, where a random node is selected a head node. Ants span over the cloud network, step by step selection of nodes following the pheromone concentrate with paths from source to destination nodes. The amount of the pheromone can vary depending upon various elements such a food source quality, distance of food source, etc. Ant's during their traversal update a pheromone table, which keeps the record on resource utilization by each node and the distance between nodes.

Pheromone is used to move forward and backward example. From under loaded node to overloaded node & vice versa in load shifting purpose. Hence in ACO next node is searched depending upon the distance between two modules and the pheromone concentration on the edges between the same nodes. In other hand, Bee colony is used for find the bee with best fitness value, which will help the task to be allocated to that particular virtual machine based on best fitness value. Employed bees will be carrying the information about the virtual machines(VM) capacity in terms of HDD (Hard Disk Drive), RAM, Processor and Bandwidth. The knowledge acquired by the employed bees is shared with onlooker bees in the hive, and then the onlooker bees decide the bee with the best fitness value or a virtual machine with similar capacity as that of tasklength to be executed. Finally, the task is allocated to that virtual machine found with the help of BCO using ACO.

Each job has its own individual flow pattern through the machine which is independent of the other jobs. Each machine can process only one job and each job can be processed by only one machine at a time for this module.The pheromone fitness is calculated by energy consumption and high profits of the service providers. Here, the two parameters used to calculate the fitness can be a dependent of the economic situations of user(s) and therefore not much appropriate to be used as a good parameter for the calculation of the fitness.Scheduling is used to maximize the efficiency of the cloud. The objective of job scheduling algorithms to proper utilization the resources and managing the load distribution between the resource and minimum execution time.

In the scheduling system target is different, usually adopt a different scheduling algorithm according to requirement. There have been various types of job scheduling algorithm exist in distributed computing system in cloud environment. Most of them can be applied in the cloud environment with suitable perfect verifications. The main advantage of job scheduling algorithm is to achieve a high performance computing and the best system throughput. Traditional job scheduling algorithms are not able to provide scheduling in the cloud environments.

Cloud computing is process of execution of various tasks over the network in such a manner there user does not know any other information about hardware components. Load balancing at differentdatacenters must be achieved in such a way so that minimum response time has been achieved by the system. In the process of execution of different tasks, data centers allocate virtual machines to different resources that utilized different components of virtual machines so that minimum datacenter cost and maintenancework and minimum response time has been achieved by the system. In the process of cloud computing, load balancing policy has been designed using HACOBEE scheduling with priority based approach. In the proposed work, resources have been provided different levels of priorities for allocation of virtual machines. Datacenters have different numbers of physical machines and these physical machines contain different number of virtual machines. The datacenters that have highest number of virtual machines can process large number of resources for output. To schedule jobs for execution, the algorithms are very expensive.

Job Scheduling aims at assigning jobs to datacenters in the cloud so that the execution time (make span) of the overall tasks of jobs is minimized. Jing Liu et al [3] proposed Multi Objective Genetic Algorithm (MO-GA) for dynamic job scheduling that combine both random and greedy initialization and searching methods.

3.1 Advantages:

- Simplicity, flexibility and robustness
- ability to explore local solutions
- ability to handle objective cost
- ease of implementation
- popular
- broad applicability, complex functions

3.2. Limitations:

- Lack of use of secondary information
- REquires new fitness tests on new algorithm parameters
- Higher number of objective function evaluation
- Slow when in sequential processing

HACOBEE ALGORITHM (PROPOSED)

1. Initialize population (N bees).
2. Evaluate fitness of population.
3. While stopping criteria are not satisfied (Forming new population) /* reproduction behaviour *
4. Generate N broods by crossover and mutation
5. Evaluate fitness of broods
6. If the fittest brood is fitter than the queen then replace the queen for the next generation
7. Choose D best bees among D fittest following broods and drones of current population (Forming next generation drones)
8. Choose W best bees among W fittest remaining broods and
9. workers of current population (to ensure food foraging) /* food foraging behaviour */
10. Search of food source in W regions by W workers
11. Recruit bees for each region for neighbourhood search
12. Select the fittest bee from each region.
13. Assign remaining bees to search randomly and evaluate their fitness's.
14. End While
15. Initialize parameters and pheromone trails.
16. While stopping criteria are not satisfied.
17. Do Make all Ants Construct their Solutions.
18. Update pheromone trails
19. END DO

FLOW CHART FOR HACOBEE ALGORITHM

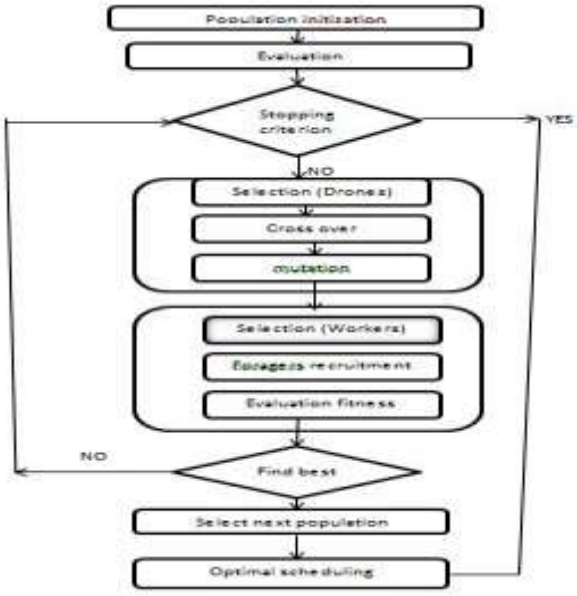

Fig 1: HACOBEE Algorithm Flow Chart

IV. Implementation And Results

The characteristics of both the algorithms Ant Colony and Bee colony optimization are being utilized for distribution of loads among various nodes in cloud environment. Both ACO and BCO algorithms execute simultaneously. In ACO, ants originate from the head node, where a random node is selected as a head node. The amount of the pheromone can vary depending upon various elements such as food source quality, distance of food source, etc. Ant's during their traversal update a pheromone, which keeps the record on resource utilization. Pheromone is usedto proposed algorithm move forward and backward i.e. from underloaded node to overloaded node & vice versa for loaddata shifting purpose. Hence in ACO next node is searched depending upon the distance between two nodes and the pheromone concentration [7] on the edges between the same nodes. On the other hand, Bee colony is used for finding the bee with best fitness value, which will help the task to allocated to that particular virtual machine based on best fitness value. Employed bees will be carrying the information about the virtual machines capacity in terms of HDD, RAM, Processor and Bandwidth. The knowledge acquired by the employed bees is shared with onlooker bees in the hive, and then the onlooker bees decide the bee with the best fitness value or a virtual machine with similar capacity as that of task length to be executed. Finally, the task is allocate virtual machine found with the help of Bee colony optimization andusing Ant colony optimization.

The proposed HACOBEE algorithm is implemented through simulation package cloud analyst tool. Java language is used for development and implementation of hybrid algorithm for load balancing and job scheduling**.** The proposed algorithm for ant colony optimization and bee colony optimization are combined to produce HACOBEE using MAT LAB TOOL. Then using MATLAB tool user friendly.

V. Result

For better performance comparison the researcher formulated several test cases for bee's algorithm, ant colony's algorithm and proposed hybrid Ant Bee life algorithm. Table 1, Table 2 and Table 3 give the results of the response time and Data Centre processing time for Ant Colony, Bee Life and the proposed algorithm respectively.

Overall Response Time Summary Time			
TIME	Avg(ms)	Min(ms)	Max(ms)
Over All Response Time	566.02	45.29	22207.9
Data center processing Time	207.30	2.36	31698.4

Table 1: ANT colony algorithm results

Overall Response Time Summary Time			
TIME	Avg(ms)	Min(ms)	Max(ms)
Over All Response Time	542.51	40.10	10306.31
Data center processing time	189.02	2.76	16920.16

TABLE 2: BEE colony optimization

Overall Response Time Summary Time			
TIME	Avg(ms)	Min(ms)	Max(ms)
Over All Response Time	462.02	26.10	10306.3
Data center processing Time	126.18	1.02	30078.2

TABLE 3: Hacobee Algorithem(Proposed Algorithem)

VI. Conclusion

New algorithm for both job scheduling and load balancing in cloud computing has been proposed. And using two approaches for ant colony optimization and bee colony optimization. In this algorithm there is emphasis on deposition of pheromone. Here it is observed that when a node with minimum load is attracted by most of the ants gives result to the maximum data deposition of pheromone resulted in decrease in the waiting time and response time of the data center. Again, this hybrid algorithm achieves overload avoid while the number of resources are increased and multi process resource used, thus the resources utilization are balanced for systems with multi resource constraints when the proposed algorithm was investigated.It can be concluded that proposed approach provides much better results than previous approaches.

VII. Future Enhancement

Implemented in cloud component in different algorithm used in decrease the make span and minimize response time. And using multi cloud job scheduling you have used. The better performance comparison the researcher formulated several test cases. Bee colony is used for finding the bee with best fitness value, which

will help the task to allocate to that particular virtual machine based on best fitness value.The better performance distribute the top most algorithm you are used in future.

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