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A STUDY OF LOAD BALANCING ALGORITHMS IN CLOUD COMPUTING

Ms Deepthi Shetty[1] & Ms Sajna S[2]

Abstract- The Cloud computing provides on demand network access to a shared pool of scalable and often virtualized resources (e.g., networks, servers, storage, applications, and services) that can be quickly provisioned and released. Clouds are high configured infrastructure delivers platform, software as service, which helps customers to make subscription for their requirements under the pay as you go model. Load Balancing is an important aspect of cloud computing for efficient operations in distributed environments. Since the Cloud operators are expanding their services rapidly and clients are demanding more services and better results, load balancing for the Cloud resources has become a very integral and important aspect. . In this paper, we do the study on Load Balancing algorithm in order to understand how this algorithm reduces the amount of power- on PM and average power consumption with power saving. .
Keywords – Cloud computing, Load balancing, ACO, Genetic Algorithm, Honey Bee, Robin Round

1. INTRODUCTION

Cloud computing is a computing paradigm for managing and delivering services over the internet. The Cloud computing provides on demand network access to a shared pool of scalable and often virtualized resources. Cloud computing takes the technology, services, and applications that are similar to those on the Internet and turns them into a self-service utility. There are several definitions for the cloud. Cloud computing comes up with various services such as infrastructure as a service, platform as a service, and software as a service.

1.1 Load Balancing:

It is a process of reassigning the total load to the individual nodes of the collective system to make resource utilization effective and to improve the response time of the job, simultaneously removing a condition in which some of the nodes are over loaded while some others are under loaded [1]. A load balancing algorithm which is dynamic in nature does not consider the previous state or behavior of the system, that is, it depends on the present behavior of the system.

Load Balancing is important for essential operations in cloud virtual environments. As cloud computing has been growing rapidly and many clients all over the world are demanding more services and better results, so load balancing is an essential and important research area. Many algorithms have developed for allocating client's requests to available remote nodes. This paper is a brief discussion on the existing load balancing techniques in cloud computing and further compares them based on various parameters like data processing time and response time etc. Load Balancing may even support prioritizing users by applying appropriate scheduling criteria.

The rest of the paper is organized as follows. Dynamic Load Balancing Algorithm are explained in section II. Conclusion and future work remarks are given in section III.

2. DYNAMIC LOAD BALANCING ALGORITHMS

2.1 – Ant colony optimization:

These are inspired by one complex behaviour of the ants : this is use to find the shortest paths and this also became the basic strategy of ant colony optimization (ACO) .This ACO have being successful and they are more successful and widely recognized algorithm.[2]These ACO leave trail upon by changing from one node to another. The ants came into the food sources. There are various factor in the intensity of the pheromone they are quality of food sources and the distance of the food.These ants uses the pheromone trails to select the next node .the ants can change their path upon encounting any obstacles In their path these ants used ACO algorithm so that they can follow each other through the network in the pheromone path.These ants also visit from one node to another. And also update the pheromone path. So that they get more solution if many more ants are visiting. The pheromone path have the shortest distance between the destination and also the besfood. The movements of these ants are independent and updates a proper solution set.

[1] Department of Master in Computer Application, St.Aloysius Institute of Management and Information Technology, Mangaluru, Karnataka, India
[2] Department of Master in Computer Application, St.Aloysius Institute of Management and Information Technology, Mangaluru, Karnataka, India

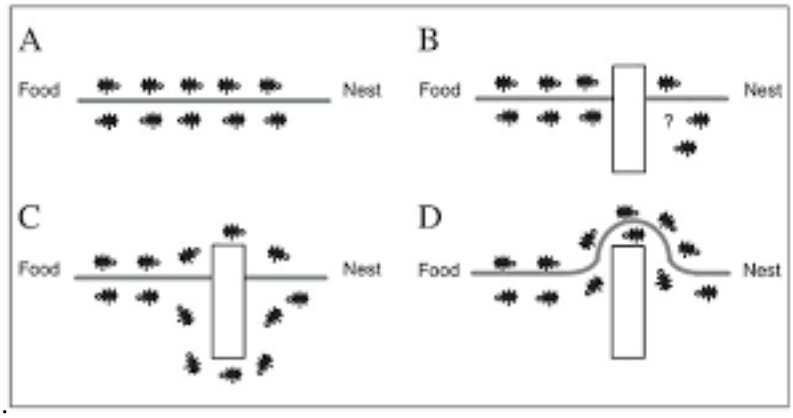

Fig 1: Ant Colony Optimization

There are 2 types involved in this ACO , they are :[4]

1. Forward movements: In this type the ants travel or visit for searching of the food .
2. Backward movements :In this type the ants go back to their original place for storing food after taking food from the source.

The main task of the ants in the ACO ago is to re distribute the work among the nodes. The ant visit the cloud network by selecting nodes for the next step for their needs.

Flowchart of ACO:

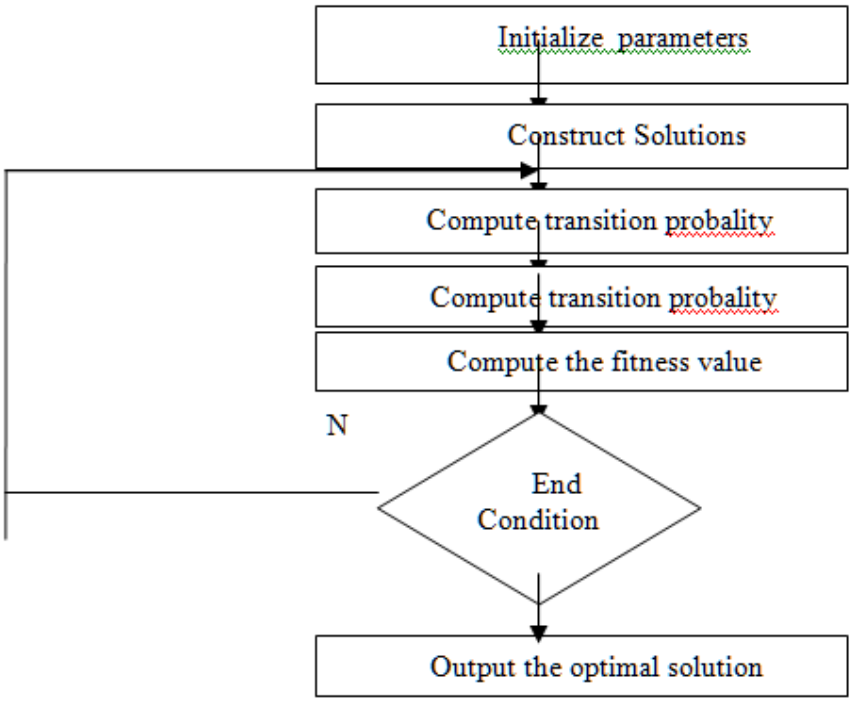

Fig 2: Ant Colony Optimization

2.2 Working of ACO Algorithm :

ACO algorithm are used for efficiently distribution of load among nodes and also used for efficient utilization of resources in cloud network. The RLBN node (Regional Load Balancing Node) and CCSP (Cloud Computing Service provider) which will act as a head node. The selection of head node is not permanent if head node is not worked properly due to inevitable circumstances the new head node can be elected The head node is chosen in that way it has maximum number of neighbouring nodes, as that can help our ants to traverse in different possible direction of the network of CCSP. These ant traverses all over the network in that way they know about the location of both nodes i.e. under loaded nodes and overloaded

nodes in network When these ants can traverse in network all ants can update the Pheromone table and this pheromone table can be used to store information about resource utilization for each node.

2.3 Genetic Algorithm: [5]

GA is the computer programs that imitate the process of biological evaluation in order to solve the problems and the model evolutionary system. Genetic Algorithm is adaptive, hands on search algorithms based on the evolutionary ideas of natural selection and genetics. They are a part of evolutionary computing, rapidly growing area of Artificial Intelligence (AI). These Algorithm is much popular for solving NP-Complete problems.

2.4 Some common key terms used in GA is :

1. Population: it is a set of possible solution for proposed problems.
2. Chromosome: Individuals in the population.
3. Gene: A variables in the chromosome.
4. Fitness function: a type of an objective function used to figure out how close the solution is achieving the set aim

2.5 Some of the operators that use in genetic algorithm are :

1. Selection: solutions with best fittest are selected
2. Crossover: for generation of Child, more than one parent is selected.
3. Mutation: altering the gene value in chromosome.

2.6 In GA there are three operations . they are :

- Selection
- Genetic operations
- Replacements

2.7 Some of the Advantages in the Genetic Algorithm are :[5]

Initial Population generation: GA works on the fixed bit strings which are representing the Single solutions.

Crossover: the objective of this step is to select most of the times the best fitted pair of individuals for crossover. The fitness value of each individual chromosome is calculated using the fitness function as given in 3. This pool of chromosomes undergoes a random single point crossover, where depending upon the crossover point, the portion lying on one side of crossover site is exchanged with the other side. Thus it generates a new pair of individuals

Mutation: Now a very small value (0.05) is picked up as mutation probability. Depending upon the mutation value the bits of the chromosomes, are toggled from 1 to 0 or 0 to 1. The output of this is a new mating pool ready for crossover.

This GA process is repeated till either the fittest chromosome (optimal solution) is found or the termination condition (maximum number of iteration) is exceeded

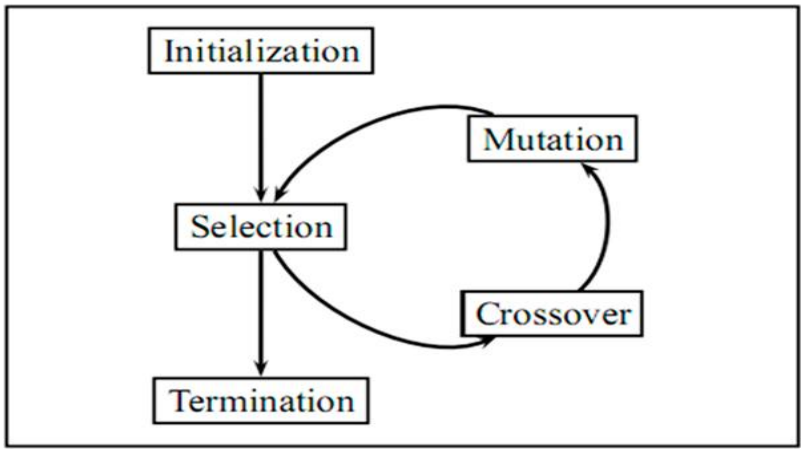

Fig 3 : Genetic Algorithm

2.8 Honey Bee Foraging :

The honey bee can extend itself over long distances as to find many food sources such as flower patches and then these bees harvests nectar or pollen from these sources. A small fraction of the colony finds the environment looking for new flower patches. When food source is encountered the scout bees go in the field surrounding the hive and check for quality beneficial. When they return to the hive, the scouts collect the food harvested[6]. There is an area in the hive called as the “dance floor”,

where waggle dance is performed by the bees that found a very beneficial food. Through the waggle dance a scout bee passes the position of its search to idle spectator, which helps in the using of the flower patch.This behavior is known as honey bee foraging behavior. [1]

There are 3 phases in Honey Bee Foraging :[2]

1. Employeed bee phase: It stay on the food source and provide the neighborhood of the source in its memory. After sharing the information in the dance area, employed bees go to food source visited by its previous cycle and choose new food source by using the information in the neighborhood. Then onlooker prefers a food source depending on nectar information provided by employed bees.
2. Onlooker bees: Onlooker means somebody who watches an event without participating in it. The bee waiting on the dancing area is an onlooker bee.
3. Scout bee phase :Simple meaning of scout is a soldier sent to gather information. The bee who carries out random search is identified as scout. Upon finding one they returned to bee hive and inform forager bees.

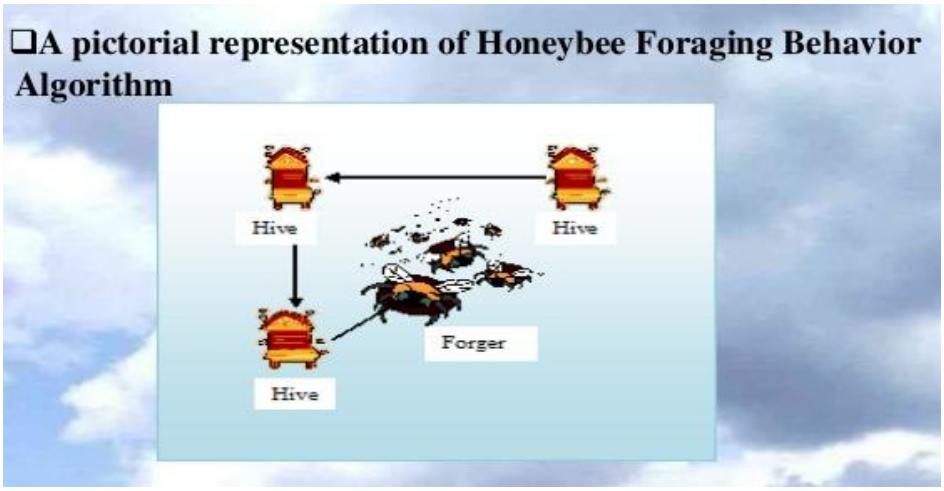

Fig 4: Honey Bee Foraging

2.9 Round Robin Algorithm[6]

Round Robin load-balancing Algorithm is used for distributing loads among the web servers .it is easy for the implementation and easy to understand .It is a very simple technique to distributes clients request across the servers. Two servers are waiting for the requests behind load balancer in system a scenario in which the first request arrives, then balancer will forward this request to the first server. And when the second request arrives to the balancer then (assuming it is coming from a different client), this request will be forwarded to the second server.once it reaches for the list,the RLBA loops back and start assigning the client request again from the first server.

In scenario where request load significantly vary,it cannot distributed the load efficiently. To solve the above problem the weighted round-robin was proposed

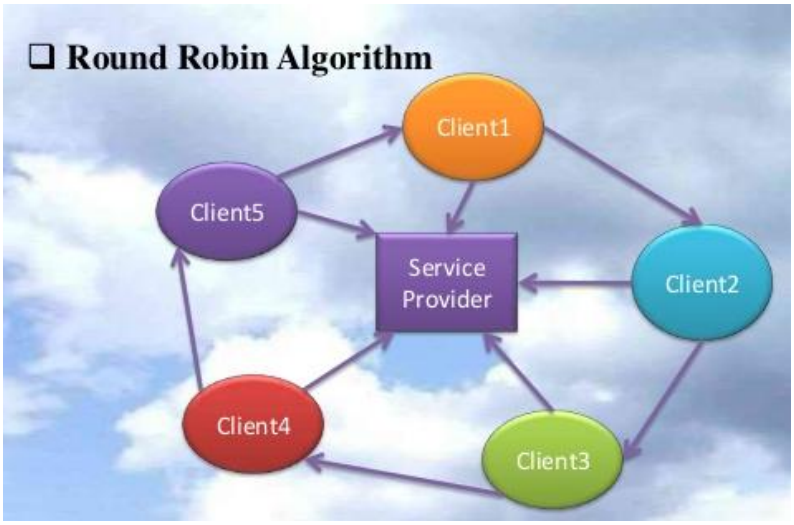

Fig 5 : Round Robin Alogorithm

2.10 Weighted Round Robin

By using weighted round robin algorithm, load balancer assigns more requests to the server 1 which is having higher capability to handling greater load than server 2. This algorithm is known as Weighted Round Robin algorithm. This Weighted Round Robin is same as Round Robin algorithm in a manner by which incoming requests are assigned to the server is still cyclical. The server with the higher specifications will be apportioned to a greater count of requests

3. CONCLUSION

Cloud computing provides everything to the user as a service over network. In the present scenario the saving of energy and managing it has become an biggest task by the infrastructure provider in the cloud data centers. As the processing the data information keeps on changing and energy utilization also dynamical varies. we studied on Load Balancing algorithm in order to understand how these algorithm can reduce the number of power-on physical machine and average power consumption with power saving.

In future we practically compare the algorithms to check the efficiency in power in different environment setup.

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