LOAD BALANCING SCHEMES: MEATAHEURISTIC VERSUS HEURISTICS

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Abstract- Cloud computing is the practice where remote server hosted on Internet for usage of mechanism to save, manage, process data and other resources. The customers that hosting on internet first pay for service and then use it. Architecture of cloud environment is distributed and parallel, Cloud system provide services to the consumers on demand basis. Load balancing in cloud is practice of dividing the amount of workload and demands across number of devices that all appropriators get served faster. The virtual machine (VM) job scheduling strategy in cloud computing online shop mainly takes the present stage of the machine which always leads to imbalance load of the system. This paper introduces the various load balancing techniques named as Ant Colony Optimization (ACO), Gravitational Emulation Local Search Algorithm (GELS), Genetic Algorithm (GA), Hybrid of ACO-GELS, Hybrid of GA-GELS and an attempt has been made to analyze these different techniques in terms of resource utilization, cost, fault tolerant, load balancing level, make span, response time, reliability and performance.

Keywords – Ant Colony Optimization, Gravitational Emulation Local Search Algorithm, Genetic Algorithm, Hybrid of Ant Colony Optimization and Gravitational Emulation Local search algorithm, Hybrid of Genetic Algorithms and Gravitational Emulation Local search algorithm.

1. INTRODUCTION
Cloud computing is an arrangement where number of services available on cloud environment and the users can directly pay for services that they want to use. Delivering of information in cloud computing is very easy. Cloud appropriators can use these services over the "Internet cloud". User of Cloud computing do not adopt the physical infrastructure; rather a third party provider help them to use the services. They use the available resources and pay for it. Example: Our experience with email is the way of thinking about cloud computing. We open our web browser, when we want to access our email, go to the email client, and then log in our email. An email client is one of the examples to understand how cloud computing works. Cloud load balancing is the procedure by which we can distribute work and resources. Load balancing used to divide multiple jobs by assigning resources among multiple computing devices so that more work gets done in minimum amount of time.

The organization of paper is follows as: Section II comprises of ACO Algorithm. Section III gives details of GELS algorithm. Section IV provides description of Genetic Algorithm Section V compares these algorithms on the basis of different parameters. Section VI Some important terms used in this paper. Finally conclusions are presented in Section VII.

2. ANT COLONY OPTIMIZATION (ACO)
Ant system was initially proposed by Colorn, Dorigo and Maniezzo in 1992. In cloud computing this technique is used for finding the shortest path. In this technique we copy the behavior of ant that they used during the searching of food. Basically Ants spread the chemical during searching of food so that the ants can smell it then copy the movement of another ant and follow the same path, the chemical is pheromone. It gives better performance and optimal solution.

3. GRAVITATIONAL EMULATION LOCAL SEARCH (GELS)
In 1995, GEL algorithm was given by Voundaris and Tesong for prospecting in a search space. More powerful algorithm was proposed in 2004 by Barry Webstar called GELS (Gravitational Emulation Local Search Algorithm). GELS algorithm is basically used as local search algorithm.

This concept is taken from the gravitation attraction. Due to gravitational force the two objects are pulled towards each other. As the objects get closer, gravitational force also gets stronger between them. Randomization concept is also introduced in this algorithm along two parameters i.e. gravity and velocity. Gravitational force is:

\[ F = \frac{G m_1 m_2}{R^2} \]

Here, \( m_1 \) & \( m_2 \) are mass of two objects, \( G \) is gravitational constant having value 6.672 and \( R \) is distance between two objects.

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Movement in GELS by two manners: In first manner, movement from current response towards the response of current response is selected. GELS second manner is movements from the responses outside of current response local neighbor space are selected. A pointer object is used to point the response with the most weight to move in a search space. Calculated gravitational force between two objects are as: 
\[ F = G \frac{(CU-CA)}{R^2} \]

Where CA= Candidate Response 
CU= Current Response 
R=Constant or may change on each iteration 
G=Gravitational attraction

4. GENETIC ALGORITHM (GA)
GA was introduced by John Holland in 1975 at Michigan University. GA is a meta heuristic algorithm which is inspired by the natural selection process. High quality solutions to optimization and search problems are commonly generated by using Genetic Algorithm. GA is basically used for Global search and is based on biological evolution. GA looks for best solution among a number of possible solutions. GA is a stochastic algorithm having gathered stochastic information which is used to select the most appropriate strings. A new set of string is generated in every generation. It then evaluates each of those new sets and decides on a fitness level for each solution set.

5. COMPARISON OF ALGORITHMS ON THE BASIS OF DIFFERENT PARAMETERS
Table 1: Comparison Table Of Load Balancing Techniques In Cloud Computing Environment

<table>
<thead>
<tr>
<th>SR No.</th>
<th>Characteristics</th>
<th>ACO</th>
<th>GELS</th>
<th>GA</th>
<th>ACO-GELS</th>
<th>GA-GELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Resource Utilization</td>
<td>More</td>
<td>More</td>
<td>More</td>
<td>More than GA-GELS</td>
<td>LESS than ACO-GELS</td>
</tr>
<tr>
<td>2</td>
<td>Cost</td>
<td>Less</td>
<td>Less</td>
<td>Less</td>
<td>Pay-per-use</td>
<td>Pay-per-use</td>
</tr>
<tr>
<td>3</td>
<td>Makespan</td>
<td>Less</td>
<td>Less</td>
<td>Less</td>
<td>Less than GA-GELS</td>
<td>GA</td>
</tr>
<tr>
<td>4</td>
<td>Load balancing Level</td>
<td>More</td>
<td>More</td>
<td>More</td>
<td>More than GA-GELS</td>
<td>GA</td>
</tr>
<tr>
<td>5</td>
<td>Fault Tolerant</td>
<td>More</td>
<td>Less</td>
<td>More</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>Reliability</td>
<td>More</td>
<td>More</td>
<td>More</td>
<td>More</td>
<td>Less than ACO-GELS</td>
</tr>
<tr>
<td>7</td>
<td>Performance</td>
<td>More</td>
<td>More</td>
<td>More</td>
<td>More</td>
<td>More</td>
</tr>
<tr>
<td>8</td>
<td>Response Time</td>
<td>Less</td>
<td>Less</td>
<td>Less</td>
<td>Less than GA-GELS</td>
<td>Less than GA, ACO</td>
</tr>
</tbody>
</table>

6. SOME IMPORTANT TERMS USED IN THIS PAPER
Resource Utilization: Resource utilization means provide services to large number of users. To balance the load in cloud computing environment resource utilization should be more. Cost: Estimate of amount to use the services available on cloud environment. Makespan: Makespan means the amount of time take to complete the tasks. It should be less for better performance. Load Balancing Level: Load balancing level is used to balance the load evenly on virtual machines. It should be more for better result. Fault Tolerance: Fault tolerance means how well a system operate under some failure event. Reliability: Result of system that how well it works and it should be high. Performance: Performance is the process of performing task and it should be high. Response Time: Time taken to respond and it should be less.

7. CONCLUSION
The paper reviews the literature of meta heuristic and heuristic load balancing techniques named Ant Colony Optimization (ACO), Gravitational Emulation Local Search Algorithm (GELS), Genetic Algorithm (GA), Hybrid of ACO-GELS, Hybrid of GA-GELS. Further, these load balancing techniques are compared by taking different parameters like Resource utilization, cost, fault tolerance, load balancing level, makespan, response time, reliability and performance. Comparison of various load balancing techniques demonstrate that ACO-GELS has better result than other existing algorithms like ACO, GA, GELS and GA-GELS.
8. REFERENCES


