International Journal of Global Engineering (IJGE) E- ISSN: 2456-3099
VOL 2 ISSUE 1 (2017) PAGES 26 - 32
Received: 1/09/2017. Published: 26/09/2017

A STUDY OF LOAD BALANCING ALGORITHM ON CLOUD COMPUTING

C.H.Sunil Kumar[1], S. Devi[2], N. Thulasi[3]
[1]Professor, [2]Assistant Professor, [3]Associate Professor
Department of Computer Science and Engineering
Dhanalakshmi Srinivasan College of Engineering and Technology, Tamil Nadu, India

ABSTRACT
Cloud computing is an rising technology aimed at allowing customers to without problems obtain a broad range of web-based offerings that formerly required amazing hardware and software program capabilities . Load Balancing is an vital factor of cloud computing for efficient operations in disbursed environments. Since the Cloud operators are expanding their services hastily and clients are annoying more offerings and higher results, load balancing for the Cloud assets has end up a very fundamental and important aspect. Load balancing entails dividing the load equally so the throughput is high with less response time. Various algorithms have been proposed to provide environment friendly load balancing . These approaches aim to decorate the average overall performance of the Cloud and supply the consumer extra satisfying and environment friendly services. In this paper we will learn about the one of a kind types of load balancing techniques and make a comparative evaluation amongst all the present techniques. We talk about and examine these algorithms to provide an overview of the present day processes in the field.
Keywords: Cloud Computing, Load Balancing, Task Scheduling.

I. INTRODUCTION

Cloud Computing Cloud computing is an rising technology aimed at permitting customers to effortlessly obtain a vast range of web-based services that until now required exceptional hardware and software program skills. Cloud is a pool of heterogeneous sources and a mesh of huge infrastructure[1]. Infrastructure refers to each the applications delivered to quit users as offerings over the Internet and the hardware and machine software in datacenter that is responsible for supplying these services. In a nutshell, Cloud Computing refers to applications and offerings that run on a allotted network.

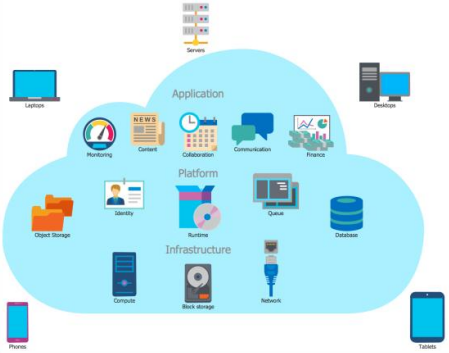

Fig 1 : Illustration of Cloud Computing

Load Balancing It is a technique of reassigning the whole load to the individual nodes of the collective machine to make resource utilization effective and to enhance the response time of the job, simultaneously casting off a circumstance in which some of the nodes are over loaded whilst

some others are beneath loaded [2]. A load balancing algorithm which is dynamic in nature does not think about the preceding nation or behaviour of the system, that is, it relies upon on the existing behaviour of the system.

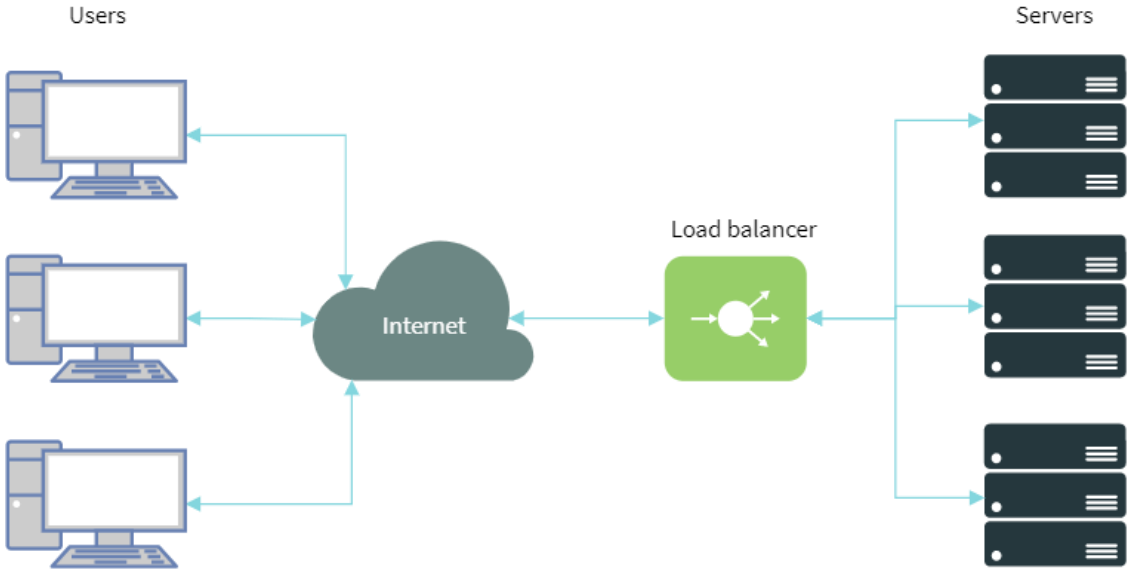

Fig 2: An illustration of Load Balancing

Load Balancing Parameters For an effective and efficient load balancing , some parameters must be considered to evaluate the load balancing techniques to get better resource optimization. Dimension parameters permits us to see whether the given technique is good enough to balance the load of the traffic on the server or not. Various load balancing measurement parameters are discussed below to evaluate the existing load balancing techniques : [3]

Parameters	**Description**
Throughput	It is deliberated as the amount of work completed against time consumed
Response time	It is the beyond time between an enquiry on a system and the response to that enquiry.
Fault Tolerance	It is the aptitude of the load balancing algorithm that allows to keep working properly in some failure condition of the system.
Scalability	It is the capability of the computer application or a product to continue to function well when it is changed in size or volume to meet user needs.
Performance	It is the on the whole check of the algorithms working. It comprises the completion of the given task against present known standards like accuracy, cost and speed.
Resource Utilization	It is used to keep a check on the utilization of various resources.

II. TYPES OF LOAD BALANCING ALGORITHMS

Load balancing algorithms can be generally labeled into two types: 1) Cooperative: - The common purpose of this kind of algorithm is to optimize the response time. 2) Non – cooperative: - All jogging tasks are independent of each other and as a result enhancing the entire response time for the local assignment [4].

Depending on who initiated the process, load balancing algorithms can be of three training as given:

- Sender Initiated: If the load balancing algorithm is initialized by way of capability of the sender.
- Receiver Initiated: If the load balancing algorithm is initiated thru the receiver.
- Symmetric: It is the mixture of each sender initiated and receiver initiated.

Depending on the modern-day state of the system, load balancing algorithms can be divided into 2 categories as given in 1) Static: It does no longer depend on the cutting-edge u . s . of the system. Prior expertise of the device is wished 2) Dynamic: Decisions on load balancing are in particular based totally on modern-day kingdom of the system. No prior appreciation is needed. It is higher than static approach.

III. A COMPARATIVE STUDY OF LOAD BALANCING ALGORITHMS

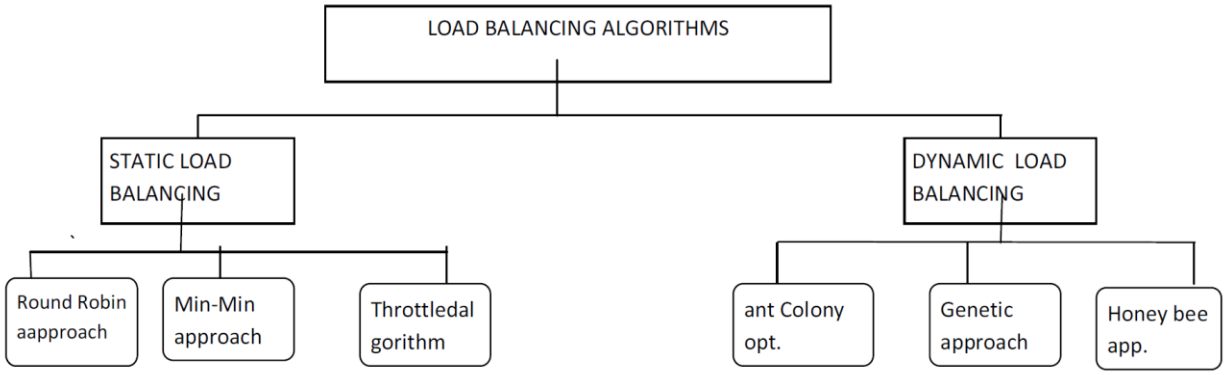

Fig 3: Different load balancing algorithms

A. Static Load Balancing Algorithms: Static Load balancing algorithms assign the duties to the nodes notably based solely on the viable of the node to device new requests. The technique is based totally totally absolutely on prior grasp of the nodes' homes and capabilities. Some of these homes are :

- node's processing energy
- memory
- Storage capacity

Static load balancing algorithms are non-preemptive i.e as soon as the load is allotted to one node it can not be transferred to any other node. Following are some of the static load balancing algorithms :

a. Round Robin Algorithm
b. Min-Min load balancing Algorithm
c. Throttled load balancing Algorithm

A.1 Round Robin Algorithm

Round-robin load-balancing algorithm (RLBA), is one of the most substantially used for distributing masses among the net servers due to its simplicity. Round Robin (RR) load balancing is one of the most common and nonetheless appreciably used approaches. It is a very easy approach which distributes client's requests across the servers. The RR load balancer forwards a purchaser request to every server one by means of potential of one. Once it reaches the give up of the handy server list, the RLBA loops back and begins assigning the purchaser requests once greater from the first server. The essential reap of RLBA is that it is very elementary to implement. However, in situations the place request load substantially vary, it can not distribute the load efficiently. To resolve the above problem, weighted round-robin algorithm was proposed . In this approach, load will be assigned relying on the weights of all the nodes. When each and every node has equal weights, they will acquire identical traffic. But but it is challenging to predict the execution time hence, this algorithm is now not very fabulous for cloud computing environment which requires sizable load balancing [5].

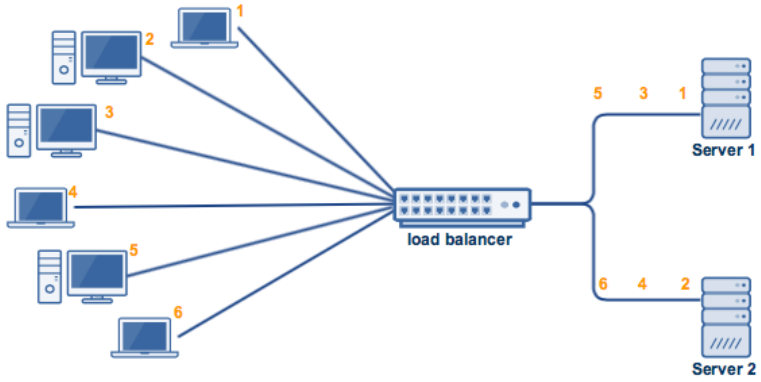

Fig 4: Round Robin Scheduling

A.2 Min-Min load balancing algorithm

The Min-Min algorithm is easy and most crucial out of all current algorithms. It begins with a set of all unmapped tasks. Then the aid which has the minimal completion time for all tasks is found. Next, the undertaking with the minimum dimension is chosen and assigned to the corresponding beneficial useful resource (hence the identify Min-Min is given). Last, the assignment is eliminated from set and the same manner is repeated through using Min-Min till all tasks are assigned (i.e., when the preliminary set is empty). This algorithm considers all jobs at a time. So it produces a better makespan and the common overall performance of Min-Min scheduling algorithm is regarded to reduce the completion time of all works. Time complexity of Min-Min algorithm when we have R assets and T obligations is : O(T 2R). In some cases, Min-Min algorithm fails to make use of the resources correctly which lead to a load imbalance. However ,the largest vulnerable spot of Min-Min algorithm is it does no longer considers the work load of every resource. Therefore, some sources maybe always get busy alternatively some nodes perhaps nonetheless [6].

A.3 Throttled load balancing algorithm

In this algorithm the load balancer continues an index desk of digital machines with their states (2 states can be there: Available or busy). The client/server first makes a request to information centre to find a appropriate digital desktop (VM) to operate the recommended job. The facts centre queries the load balancer for allocation of the VM. The load balancer scans the index desk from pinnacle till the first on hand VM is placed or the index table is scanned fully.

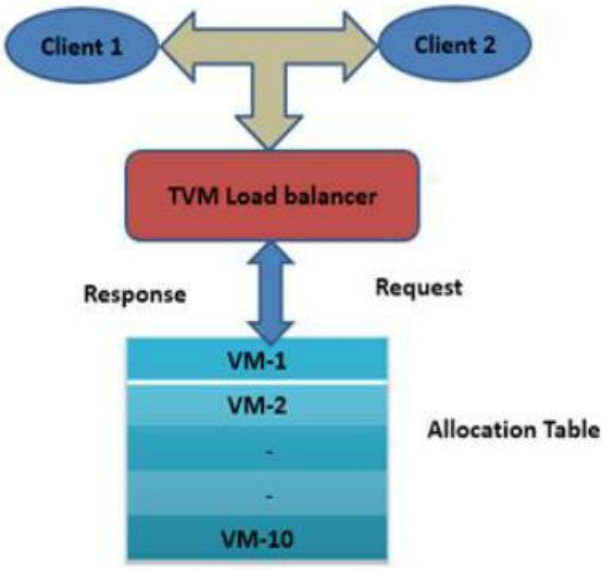

Fig 5: Throttled load balancing algorithm

If the VM is found, the information centre is loaded . The files centre communicates the request to the VM recognized thru the load balancer. Further, the statistics centre acknowledges the load balancer of the new allocation and the facts centre revises the index table accordingly. [7]

B. Dynamic load balancing algorithms:

Dynamic load balancing algorithms take into account the one-of-a-kind attributes of the node's computing knowledge and neighborhood bandwidth [8]. Most of these algorithms work on a combination of grasp based totally totally on prior gathered statistics about the nodes in the Cloud and run-time homes gathered as the chosen nodes technique the task's components. These algorithms assign the tasks and would possibly also dynamically reassign them to the nodes based totally on the attributes gathered and calculated. Such algorithms require ordinary monitoring of the nodes and undertaking development and are generally more challenging to implement. However, they are greater right than static strategies and thus, ought to end result in more efficient load balancing.

Following are some of the dynamic algorithms used in load balancing:

- Ant Colony Optimization
- Genetic Algorithm
- Honey Bee Foraging

B.1 Ant Colony Optimization

This algorithm is stimulated by means of skill of one complicated habits of ants : the potential to discover shortest paths, this has develop to be the fundamental approach of ant colony optimization (ACO) which is the most successful and extensively recognized algorithmic method exceptionally based totally on ant behavior.[3]

The ants go away a pheromone trail upon shifting from one node to another. By following the pheromone trails, the ant as a end result got here to the meals sources. The depth of the pheromone can differ on a wide variety elements like the remarkable of food sources, distance of the food, etc. The ants use these pheromone trails to pick the next node. The ants can even alter their paths upon encountering any boundaries in their path. This phenomenon of the ants is used in ant colony optimization (ACO) algorithms for the place the ants observe each other through a community of pheromone paths[9]. The ants upon traversal from one node to every other change the pheromone course of that path, so a route will end up greater feasible if greater ants traverse upon it. Paths that have the easiest pheromone depth have the shortest distance between the point and the great ingredients source. The actions of these ants independently replace a answer set. The action of ants in this machine is of two types: [9]

1. Forward moves -In this type of movement, the ants move/traverse for looking the meals sources or for extracting the food.

2. Backward movements-In this variety of movement, the ants traverse again to their unique area for storing the meals after selecting up food from the meals sources.

The foremost mission of ants in the ACO algorithm is to redistribute work among the nodes. The ants traverse the cloud network, identifying on nodes for their subsequent step according to their needs.

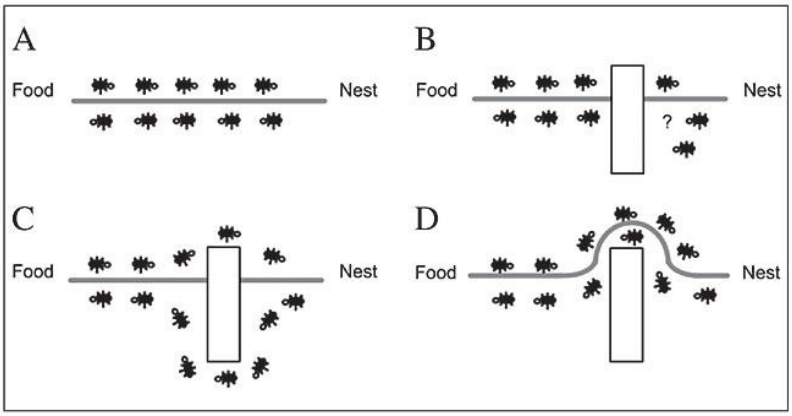

Fig 6: Ant Colony Optimization

B.2 Genetic Algorithm

Genetic algorithms (GAs) are computer functions that mimic the strategies of organic evolution in order to clear up troubles and to model evolutionary systems. These are adaptive, heuristic search algorithms based totally absolutely on the evolutionary ideas of natural willpower and genetics. They are a segment of evolutionary computing, growing location of Artificial Intelligence (AI) and are stimulated via skill of Darwin's concept of evolution-"Survival of the fittest". Genetic Algorithm (GA) is a complete lot popular for fixing NP-Complete problems. Some accepted key terms used in GA are :

Population - two it is a set of viable solutions for proposed problem.

Chromosome - the of us in the population.

Gene - a variable in a chromosome.

Fitness Function - a kind of an goal characteristic used to determine out how shut the answer is accomplishing the set aim.

Following are the operators used in genetic algorithm:

Selection - alternatives with splendid fittest are selected.

Crossover - for generation of Child, extra than one father or mother is selected.

Mutation - altering the gene charge in chromosome.

A effortless GA is composed of three operations: selection, genetic operation, and replacement.

The advantage of this approach is that it can cope with a enormous search area and is relevant to complicated objective function .[11]

1. Initial populace generation: GA works on steady bit string illustration of man or woman solution. So, all the possible preferences in the reply location are encoded into binary strings. From this an preliminary populace of ten (10) many chromosomes are chosen randomly.

2. Crossover: The objective of this step is to select most of the cases the great geared up pair of humans for crossover. The fitness charge of every character chromosome is calculated the usage of the fitness characteristic as given in three This pool of chromosomes undergoes a random single point crossover, the place depending upon the crossover point, the component mendacity on one side of crossover net web page is exchanged with the different side. Thus it generates a new pair of individuals.

3. Mutation: Now a very small cost (0.05) is picked up as mutation probability. Depending upon the mutation price the bits of the chromosomes, are toggled from 1 to zero or zero to 1. The output of this is a new mating pool ready for crossover. This GA technique is repeated till either the fittest chromosome (optimal solution) is determined or the termination situation (maximum vast variety of iteration) is exceeded.

GA gadget is repeated till both the fittest chromosome (optimal solution) is discovered or the termination situation (maximum vary of iteration) is exceeded.

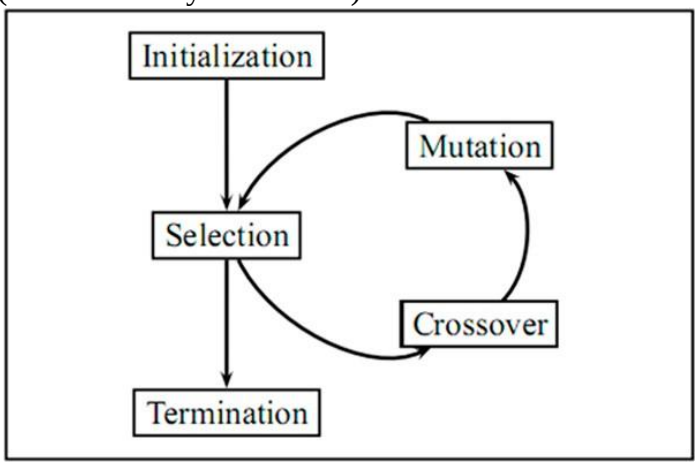

Fig 7. Steps worried in Genetic Algorithm

IV. CONCLUSION

In this paper, we surveyed greater than one algorithms for load balancing for Cloud Computing. We cited the metrics that are used to choose a appropriate and environment friendly load balancing algorithm for any problem. Then, we compared the current algorithms based totally on the metrics we discussed. We also cited the blessings and risks of these algorithms. From the aforementioned assessment, we come to a conclusion that static load balancing algorithms are constant than the dynamic ones. However dynamic algorithms are constantly higher in contrast to static ones due to the fact of the equal above stated parameters. In future work, we favor to put into effect all these algorithms and take a appear at for precise parameters to choose a proper load balancing algorithm.

REFERENCES

[1] Mayanka Katyal and Atul Mishra, "A Comparative Study of Load Balancing Algorithms in Cloud Computing Environment", International Journal of Distributed and Cloud Computing, Volume 1, Issue 2, December 2013.

[2] Reena Panwar and Bhawna Mallick, "A Comparative Study of Load Balancing Algorithms in Cloud Computing",International Journal of Computer Applications Volume 117 – No. 24, May 2015 .

[3] Abhinav Hans and Sheetal Kalra, "Comparative Study of Different Cloud Computing Load Balancing Techniques.", 2014 International Conference on Medical Imaging, m-Health and Emerging Communication Systems .

[4] Kunjal Garala and Namrata Goswami, "A Performance Analysis of Load Balancing Algorithms in Cloud Environment.", 2015 International Conference on Computer Communication and Informatics (ICCCI -2015), Jan. 08 – 10, 2015 .

[5] Furqan Alam, Vijey Thayananthan and Iyad Katib , "Analysis of Round-robin Load-balancing Algorithm with Adaptive and Predictive Approaches.", 2016 UKACC 11th International Conference on Control Belfast, UK, 31st August - 2nd September, 2016.

[6] Huankai Chen, Professor Frank Wang, Dr Na Helian and Gbola Akanmu, "User-Priority Guided Min-Min Scheduling Algorithm For Load Balancing in Cloud Computing."

[7] Durgesh Patel and Anand S Rajawat, "Efficient Throttled Load Balancing Algorithm in Cloud Environment", International Journal of Modern Trends in Engineering and Research, 2015.

[8] Klaithem Al Nuaimi, Nader Mohamed, Mariam Al Nuaimi and Jameela Al-Jaroodi , "A Survey of Load Balancing in Cloud Computing: Challenges and Algorithms.", 2012 IEEE Second Symposium on Network Cloud Computing and Applications.

[9] Kumar Nishant, Pratik Sharma, Vishal Krishna, Chhavi Gupta, Kunwar Pratap Nitin and Ravi Rastogi, "Load Balancing of Nodes in Cloud Using Ant Colony Optimization", 2012 14th International Conference on Modelling and Simulation.

[10] Hussain. A Makasarwala and Mr.Prasun Hazari, "Using Genetic Algorithm for Load Balancing in Cloud Computing", ECAI-2016, International Conference 8th Edition, Electronics Computers And Artificial Intelligence.

[11] Kousik Dasgupta, Brototi Mandal, Paramartha Dutta, Jyotsna Kumar Mondal and Santanu Dam, "A Genetic Algorithm (GA) based Load Balancing Strategy for Cloud Computing." ,International Conference on Computational Intelligence: Modeling Techniques and Applications (CIMTA) 2013.

[12] Harshit Gupta and Kalicharan Sahu, "Honey Bee Behavior Based Load Balancing of Tasks in Cloud Computing.", International Journal of Science and Research (IJSR) .

[13] Anju Baby and JenoLovesum, "A Survey on Honey Bee Inspired Load Balancing of tasks in Cloud Computing.", International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 12, December – 2013.

[14] Anna Baby, Joshua Samuel Raj, "An efficient load balancing using Bee foraging technique with Random stealing", IOSR Journal of Computer Engineering (IOSR-JCE), Volume 17, Issue 2, Ver. V (Mar – Apr. 2015).