

A Comprehensive Study of Various Load Balancing Techniques used in Cloud Based Biomedical Services

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Abstract

With an increase in the demands, the Cloud computing has become one of the ongoing scalable approaches to fulfill the cloud based services. The biggest advantage of the cloud computing is the ability to overcome the infrastructural challenges those are earlier faced by other technologies. Since the technology is new, therefore the development of the whole structure is not so efficient. It does have a lot of issues on which various scientists and others are working on. Scheduling, load balancing, fault tolerance, etc. are various challenges faced by cloud computing. For this purpose various techniques and algorithms have been proposed. In this paper, we will discuss the issue of load balancing of cloud computing and we will study the different types of load balancing techniques used in in biomedical services and make a comparative analysis among all the existing techniques.

Keywords: *(OLB + LBMM), Genetic Algorithm, VectorDot, Stochastic Hill Climbing, LBVS- H, Ant colony optimization algorithm, Compare and Balance, Honey Bee Foraging*

1. Introduction

Cloud computing is one the emerging technology, which provides the service of software for lease. Cloud computing allows the user to make demands and provide the services accordingly to the users. People now a day's get the services according to their demands therefore they do not have to pay unnecessary for the things they don't have to use. People now a day's get the services according to their demands therefore they do not have to pay unnecessary for the things they don't have to use. Cloud computing is efficient and scalable, but maintaining the stability of processing so many jobs in the cloud computing environment is a very complex problem with load balancing receiving much attention from researchers [1].

At the infrastructural level, it is impossible to maintain the one or more free service to fulfill the demand at the same time. Since without any load balancing techniques the system will face the traffic and ultimately gets crashed. Application of load balancing and redundant mirrored databases in cluster techniques, across multiple availability zones, reduces the chance of outages that could simultaneously affect the services in cloud systems [2]. We will discuss the various load balancing comparison parameters and then give a brief introduction to all the load balancing techniques existed. And the end of the paper, we will discuss the comparison among all. Recently, public cloud has been made available as a pay per usage model while private cloud can be built with the infrastructure of the organization itself [3]. Scalability, one of the very important features of cloud computing, is also enabled by load balancing [5].

2. Measurement Parameters for Various Load Balancing Techniques

An efficient load balancing techniques is the one that avoids the traffic and balances the load equally therefore there must be some parameters to evaluate the load balancing

techniques to get better resource distribution for the user demands. In this paper, we used various load balancing measurement parameters to evaluate the load balancing techniques which are discussed below:

- **Throughput:** It is the amount of outputs that a computer can perform on a given input in the given amount of time.
- **Response time:** It is the amount of time used to put the user query in concern for execution.
- **Fault tolerance:** It is the ability of the load balancing algorithm that allows to keep working properly in any failure condition of the system.
- **Scalability:** It is the ability to expand itself according to required conditions.
- **Performance:** It is the overall 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.

3. Load Balancing Algorithms

Various load balancing techniques used in cloud based biomedical services are discussed below:

- (OLB + LBMM) :** In [10] author had proposed a two-stage scheduling algorithm that aggregates OLB (Opportunistic Load Balancing) and LBMM (Load Balance Min-Min) scheduling algorithms to employ better accomplishing efficiency and conserve the load balancing of the scheme. In OLB scheduling algorithm, each node is kept in an operative state to attain the destination of load balance and LBMM scheduling algorithm is employed to downplay the execution time of each job on the node thereby downplaying the overall windup time. This aggregated coming hence aids in an efficient employment of resources and raises the job efficiency.
- Genetic Algorithm:** In [7] author proposed a novel algorithm for load balancing using genetic approaches. Author tries to eliminate the challenge of the inappropriate distribution of the execution time, which uses to create the traffic on the server. The Author had used a simulation environment to perform the execution and results of their own proposed algorithm. Also author compared its simulation result with the existing techniques like First come first server (FCFS) and Round Robin (RR).
- VectorDot:** In [8] author had purposed a new load balancing algorithm called VectorDot. VectorDot holds the hierarchical complexes of the data center and multidimensionality of resource piles crosswise servers, network switches, and storage in a nimble data center that has desegregated server and memory virtualization engineering sciences. VectorDot exercises dot product to differentiate nodes based on the item necessities and helps in getting rid of overburdens on servers, switches and storage nodes.
- Stochastic Hill Climbing:** In [11] author proposed a mild figuring load balancing approach for load balancing. Author used the local optimization scheme stochastic hill climbing for allotment of ingress chores to the virtual servers or servers. Author examined the execution of the algorithm with the help of the cloudAnalyst simulator, which is a cloudSim visual modeler. The execution is examined both quantitatively and qualitatively and made a comparison with Round Robin (RR) and First Come First Serve (FCFS). It is one of the *kinds* of the hill climbing algorithm which is utilized for the load balancing. As like hill climbing, which prefers the most outrageous uphill

motility stochastic hill climbing opts arbitrarily from the uphill moves with effectual chance.

- E. *LBVS- H.*: In [12] author had proposed a load balancing, virtual depot scheme (LBVS) that offers a large shell net data storage model and Storage as a Service model based on Cloud Storage. Reposition virtualization is accomplished using a scenario that is three-layered and load balancing is attained using two load balancing parts. It aids in bettering the efficiency of coincident admittance by using replication balancing further slimming the response time and raising the content of tragedy recuperation. This strategy also helps in improving the usage pace of storage resource, flexibleness and lustiness of the scheme.
- F. *Ant colony optimization algorithm*: In [4] author had proposed a load balancing algorithm based on trail laying principle. Ants when cracks out for hunt of food riffs a trail of the track for the other ants so that they do not have to recover the track. The ants will just follow the dogged route and will discover food. Likewise, the author used this precept and asserts a pheromone table of the route that the factors use from origin to goal and the routing tastes. The route is updated at each new position with the distance measure which admits the other mobile agents to choose the littlest route. The Author had used this algorithm for load balancing of the requirements on the cloud by discovering the server's free content and processing all the servers as the virtual server. To resolve the trouble of the load balancing author had chosen the demeanor of the ants in hunt of the food. Since ants had a very well-informed way for discovering the food by the method of shortest distance, author took that into the consideration. Ants uses the rule of trail lying by omitting the pheromones on the land by ending on some points on the way through their motion which secreted by pheromone gland. That put a trail for the ants to come back to their dependency after they found food.
- G. *Compare and Balance*: In [13] author had directed the trouble of intra-cloud load balancing amongst strong-arm hosts by adaptive live migration of virtual machines. A load balancing model is planned and carried out to melt off virtual machines' migration time by partook storage, to counterweight load amongst servers according to their processor or IO usage, etc. and to keep virtual machines' zero-downtime in the process. A dispersed load balancing algorithm compare and balance is also proposed that is based on sampling and reaches equilibrium very fast. This algorithm promises that the migration of VMs has been always from high-cost strong-arm hosts to low-cost host, but arrogates that each physical host has enough memory which is a frail supposition.
- H. *Honey Bee Foraging*: In [9] author had proposed an algorithm honey bee foraging algorithm. Honey bee with the dancing deportment instigated the author to use this thought for the algorithm. When honey bees go in hunt of food, they do the exceptional dance known as the waggle dance on obtaining the food to state their leftover members that they had found the food. The character of the dance states the quality and the quantity of the food they found and also the dance tells the accurate outdistance of food from the beehive. Author used this thought and sorted the servers below the virtual server with their own virtual waiting line. Each server treating the requirement from its queue first computes the lucre which is corresponding to the lineament that bees display in waggle dance. In load balancing this gain or the waggle dance is matched to the measure of time needful to meet the petition or the resources used to satisfy the postulation.

4. Conclusion and Future Work

Cloud computing is more usable now a day's therefore the load balancing is becoming a big challenge to overcome. There are various techniques that are proposed by the various researchers to overcome the challenge of load balancing. In this paper we have made a survey and compared various existing load balancing techniques used in biomedical services. We have made the comparative analysis of different algorithms of load balancing using certain parameters. Since all the techniques covered in this paper are not fully effective, therefore there must develop new techniques which can overcome the parameters like fault tolerance and response time. There are many more parameters which can affect the efficiency of the load balancing techniques which can be included in further study. Therefore, to propose a new technology, one must include the new parameters to evaluate the results.

Comparison of Existing Load Balancing Techniques Based on Measurement Parameters Discussed in Section 2

Metrics	Throughput	Response time	Fault tolerance	Scalability	Performance	Resource utilization	Overhead
(OLB + LBMM)	✗	✓	✗	✗	✓	✗	✓
Genetic Algorithm	✗	✗	✗	✗	✓	✓	✗
VectorDot	✓	✗	✗	✗	✗	✓	✗
Stochastic Hill Climbing	✓	✓	✗	✗	✓	✓	✗
LBVS- H	✗	✗	✗	✗	✗	✓	✗
Ant colony optimization algorithm	✗	✗	✗	✗	✓	✓	✗
Compare and Balance	✗	✓	✓	✗	✓	✗	✗
Honey Bee Foraging	✗	✗	✗	✗	✗	✓	✗

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