

A load balancing model using bio inspired firefly algorithm in cloud computing

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Abstract

Cloud computing is a model which helps in accessing the end-users interface which is adjustable as well as flexible service on Internet. The primary aim implemented scheme is for maximizing utilization of resource. It also offers a load which is good balanced compared to the all other resources in the servers of cloud. Some fundamental characteristics like usage of memory, process time, rate of the access, a resource load model can be deliver, by considering the load index which is new, present load computed to the virtual machine cloud server shared resources. If a load index calculated to the resources then initiation of balancing load for efficient utilization of resources. After all resources load index computed, the load balancing operation started to use the resources effectively by assigned resources processing for respective node for decreasing values of the load. The assignment of the resources to the nodes which are proper will become a problem i.e. optimal distribution. For this huge number of optimised schemes like algorithm of genetic, algorithm of modified genetic will be used to balance the load. But all these are may not be effective to offer best solutions. Because, the exploration issues are not overcome in these approaches. However, we can say that procedure of efficient optimisation is good for balancing load compared to others. Therefore, we implemented a new scheme for optimisation approach which is known as firefly algorithm for balancing the load. Initially the index table updated with the help of available virtual servers as well as request sequence. After that, based on new formulae, the load index will be calculated. The bal-ance of the load can be done with the help of load index using the algorithm of firefly. The results which are expected can be gathered and the implemented algorithm is efficient to balance the load in optimised time intervals.

Keywords: Optimization; Cloud Computing Network; Firefly Algorithm; Load Balancing; Optimization Algorithms; Bio Inspired Algorithm.

1. Introduction

For numerical optimisation, biologically inspired algorithms are most helpful. For travelling salesman, the NP-hard is special among all the issues. The Kennedy proposed PSO algorithm in 1995, swarm behaviour such as fish & schooling of bird of nature known as swarm intelligence. It is having various similarities compared to multiple genetic scheme. Cloud computing has served the ever growing storage and data processing needs, however it has also given rise to a number of risks [2]. It uses the real number randomness and communication. So it is easy to implement with the help of real numbers. Presently, the cloud computing is popular for hardware as well as software since we provide services which are scalable by using cloud computing. It is dispersed as well as flexible because the properties spread with network. System entire resources can be used for replying a request of client that have intercommunication between system various components and the component design for dealing a request. It leads network tailbacks and distributed system excessive charge in some of the modules. This May over charge where as another may not or may low charged. In a cloud computing environment, the resources are used when required and this is expected to translate into reduced costs of maintenance and elastic scalability [2]. For solving this issue, the techniques of load balancing developed as well as utilised with researchers. Moreover, cloud computing have magnificent scope, hence so many complications have to solve to realize cloud computing even now also. One of the primary issues among all is Load balancing. For cloud computing realization, it

plays major role. Balancing of load may be a process for marking functional resource consumption with reallocation of entire load for nodes which are discrete in nature for recovering job time response [4]. To emerge load balancing, the primary thing which should be considered is load approximation, load assessment, different system stability, system performance, nodes interaction, nodes selection. The mechanism of load balancing of cloud computing need 3 conditions in swift as follows below.

- 1) Not hefty in local load case. It may lead to local self-organisation for reducing exchange of information.
- 2) The heterogeneous environment used for cloud computing balancing system.
- 3) The average system response time plays a vital role in load balancing mechanism of cloud computing which lead to increase in system output. For solving various problems, a certain work performed on the balancing load among dynamic network nodes.

If you computed the load index then entire resources, operation of load balance may initiate effective utilisation of dynamic resources with assigning resources to appropriate node for decreasing value of the load. Resource assigning for proper nodes are problem of optimal distribution hence various optimise schemes like genetic, modified may utilise to balance load. To utilise, a optimise process instead genetic scheme can be lead for better balancing load. It is a typical algorithm Based on current optimization algorithm, which is called as firefly algorithm for load balancing, initially, index table maintained with virtual servers as well as request sequences are available. After that, index of the

load may compute according to new obtained formulae. Based on this load balancing function is done with firefly algorithm.

Contributions of implemented approach is as follows:

- One scheduling scheme designed which gave the importance for load balancing on the nodes
- For optimising the queue schedule, the firefly algorithm is utilised.

2. Related work

- Particle Swarm Optimization

It is a computational method that optimizes the problem by iteratively trying to improve the solution with regard to a given measure of quality. Meta-heuristics are based on the iterative improvement of either a population of solutions (as in Evolutionary algorithms, Swarm based algorithms) or a single solution (eg. Tabu Search) and mostly employ randomization and local search to solve a given optimization problem [10]. It solves the problem by having the population of solutions in the search space. Each particles movement is influenced by local best known position but it also guided towards best known position in the search space which are updated as a better position this is expected to move towards the best solutions. The functions of space of Objectives searched by The PSO algorithm with the help of regulating the individual iterations, which are called as particles. Here we mentioned the easiest and popular PSC standard. The moment of Particle having 2 primary components, one is component which is stochastic and the other is component which is deterministic. The particle attached to the current global best g^* position as well as history own best location x^* at one time. If a particle want to know the better location compared to earlier location, then the present best location updated. The motto is finding the best global from present best solutions till objective no more long improvement.

3. Problem description

In cloud computing system full resources have to cooperate for responding to request of client that needs intercommunication among multiple system components for designing components subset for dealing with request. It lead bottlenecks in network as well as unbalanced charge in system which is distributed. Load balancing cloud computing systems is the one of the major challenge which is important for Cloud Computing realization. Nature inspired algorithms are meta heuristics that mimics the nature for solving optimization problems opening a new era in computation[10].

To develop load balancing strategy, some primary points that have to consider is the following

- Load estimation
- Load comparison
- Different system stability
- System performance
- Nodes interaction
- Work nature which has to transfer
- Node selection

An effective approach have to be developed for tackling the issues about to load balancing in network of cloud computing. The main intension is we have to develop the load balancing approach using firefly algorithm. In which we have to maximize utilization of resources as well as achieve well balanced load. With the help of various factors like usage of memory, process time, rate of access, every model load resource can be delivered. Depending on current load index the present load computed to all resources is shared in cloud server virtual machines. Genetic and modified can also be utilize to balance load, but utilizing an optimized process instead of genetic scheme can lead for better balancing load. It is a typical algorithm Based on current optimization algorithm, which is called as firefly algorithm. For load balancing initially index table is maintained with virtual servers as well as request sequences.

The typical schemes do not provide best solutions because the exploration as well as exploration problem are not overcome. Effective algorithm have to be used based on that, we implemented an optimized algorithm called firefly algorithm for load balancing.

4. Computing network load balancing

In the atmosphere of the cloud computing, the servers nodes, dynamic load, the resources are assigned to specific node dynamicaly to meet some needs, like excellent utilization of resources increases performance as well as fast response.

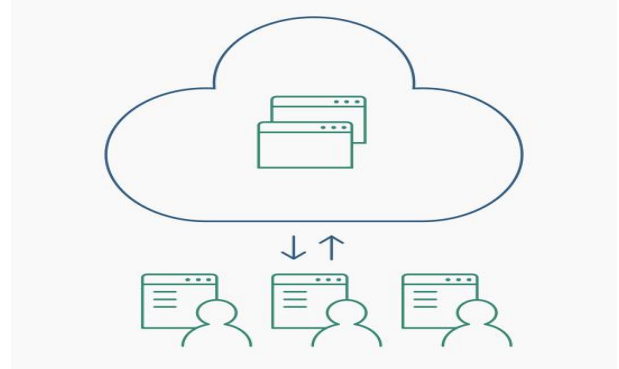


Fig. 1: Cloud System.

The on top of topology are often delineated as Associate in Nursing $G(V, E)$ purposeless graph, G is set of nodes within chart, E is for association set among all nodes. C_i is for server node of cluster management. C_{ni} represents controller node that may be a physical machine. every C_i node managing m , C_{ni} which is node controller, you'll be able to run k virtual machines on every C_{ni} as well as using V_i for representing machine of virtual, within the cloud service setting, application, package as well as alternative code are in many V_i nodes for running though problem with cloud resource programing have compelled to be self-addressed once employment requests cloud0 resources services use cloud resources controller programming for adopting In multi-objective downside that looks to optimum answer. Per watching the parameter of multi-objective, cluster controller may computed.

5. Firefly algorithm

Here we developed replacement firefly formula and analysed similarities as well as variations with the help of particle swarm optimisation. And tendency to then enforced as well as comparison of the algorithms. The real beauty of nature inspired algorithms lies in the fact that it receives its sole inspiration from nature[10]. We simulated to locate worldwide optima assorted take a look at functions recommend particle swarm usually good ancient schemes like genetic firefly formula can superior for every PSO as well as GA if consider each potency as well as rate of success. Another improvement for convergence formula may alter randomisation. These might kind necessary topics for more analysis. Moreover, as a comparatively simple extension, the Firefly formula are often changed to unravel multi objective optimisation issues. The FA optimization seems more promising than particle swarm optimization in the sense that FA can deal with multimodal functions more naturally and efficiently [6]. Simulations and results indicate that the proposed firefly algorithm is superior to existing metaheuristic algorithms [6]. Additionally the appliace of firefly algorithms together with alternative algorithms could be an Associate in Nursing exciting space for more analysis.

6. Proposed system

The firefly formula peculiar characteristic can customize within projected scheme for thinking about firefly formula like program-

ming formula of the load balance. The outlined attractiveness in algorithm of firefly used for calculate index of programming as well as the serves of the distance calculation for seeking out nodes which are associated within the network of cloud.

The projected scheme triggering the way to generate efficient load equalisation scheme within network of cloud for scheduling nodes. Programming method is implemented with firefly formula. Programming method will set nodes by load possession slimmest alternative, we consider virtual machine having the three servers as well as each server contain 3 nodes.

Projected scheme have main steps of 3 for programming to projected machine which is virtual with equalisation of its nodes.

Various step are often mentioned as:

- Generation of Population
- Calculation of programming index.
- Least node chooser.

a) Generation of Population

Population is nodes in the cluster served via system of cloud according users request to server. Coming request, the node fetched by server, and the request is served.

According to the process time of the servers a scheduling list will be generated.

This list is considered as the initial population. The server on request of client searches for a free node. This free node is allocated as a response for the request by server. The firefly algorithm is applied on this initial population to generate an effective scheduling strategy for the cloud system by giving priority to load balancing.

b) Calculation of programming Index

The index of programming one of the prime factors poignant programming method. Before calculation of programming index, allow for discussing concerning the parameters choice to first population.

In this proposed approach the attraction is between request and the node. We consider CPU rate, memory rate and processing time to calculate attraction between the node and the request.

$$\text{attr}(n_i) = \frac{p_i}{(\text{cpu}_i + \text{mem}_i)}$$

Attr (ni) is nodes attraction the request attracts node if it have high attraction. Pi is process time interval to actual node, ci is cpu rate and memi is rate of memory nodes.

$$SI = \sum_{i=1}^n \frac{p_i}{(\text{cpu}_i + \text{mem}_i)}$$

Now we calculate scheduling index it is a summation of all the attraction values of nodes in the queue. Since we have many scheduling queues in an instant we consider the particular queue with highest scheduling index.

c) choice of Node with Min Load

Node selection with least load is the actual implementation of firefly concept. It is a process of subjecting a distance calculation between the nodes in the scheduling queues. We initially find the node with least attr(ni) values. The node with least attr(ni) value is considered as the pivot point for the queue.

$$\text{Dist} = \sqrt{\sum_{j=1}^k (n_i - n_j)^2}$$

The distance is calculated using above formula where ni is selected node and nj is comparing node now once all the nodes are calculated they are arranged in sorted order according to the pivot node. Since we already sorted the queues with scheduling index value the top queue will be considered as effective scheduling queue.

7. Experimental analysis

Planned programming algorithmic program is a process of optimization of the scheduled queue between request and the node to balance load. The concept of the proposed approach is explained above.

a) Criteria of Evaluation

Major analysis employed in projected programming methodology is on scheduling queue on cloud network. Parameters which are taken into account are the C.P.U, rate of utility as well as rate of memory. The time is calculate by considering the time taken to generate scheduled queue.

b) Evaluation of the Performance

In the performance analysis, we have a tendency to take into account the simulated network of cloud because system analysis parameters which are variable, within planned analysis rate of utility as well as rate of memory usage should also be evaluated. In

Analysis of performance, we have a tendency to provide 2 varieties of analysis.

c) CPU Utility Rate Analysis

For effective rate of utilization of C.P.U. Associate degree analysis provide efficiency of projected scheme in various levels of load C.P.U. rate. The execution time taken for various rate of C.P.U. can be described with load time as well as used memory.

d) Memory Rate Analysis

For effective rate of utilization of memory and its performance at different memory load. Associate degree analysis provide efficiency of projected scheme in various levels of memory load rate. The execution time taken for various rate of memory can be described with load time as well as used memory.

8. Conclusion

In this study, we have a tendency to plan a programming algorithmic rule to services while a network of cloud when concentrate over equalisation of load. Planned scheme may deal cloud network of the simulated by using requests set as well as servers. These are related to each node is equipped various attributes. These attributes manage every node load. Equalisation of load according to scheduled list. The planned scheme impressed via the firefly algorithmic rule, owing to the attracting firefly algorithmic rule options. Planned scheme designed in three steps, initial population may generated with the help of cloud network, after that calculation of programming index and then we select the node with least load. Conducted analysis verified that the planned approach is economical to optimize the schedules with the help of firefly algorithm.

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