International Journal of Computer Applications Technology and Research
Volume 4– Issue 11, 786 - 788, 2015, ISSN: 2319–8656

Evaluating Reliability and Load Balance in Grid Distributed Systems

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Abstract: Grid computing systems are new and important fields, and they differ from common distributed systems due to resource subscription in large scales, high efficiency and creative applied program. Grid computing system is a wide distributed system. The main and special problem of grid concept is coordinating resource subscription and solving the problem dynamically and multi-distribution programs. Grid computing system is a distributed computing system, and in this system, communication and processors have considerable effects on reliability of grid computing. In this paper, the features of grid computing systems have been described, and some algorithms have been presented to analyze reliability of system and grid program. In this study, an intelligence algorithm has been used to create load balance in grid. Since grid environment is dynamic, firefly algorithm has been used to create load balance in sites. The results of algorithm simulation have been presented by Matlab software, and it is compared with learner particles swarm algorithm, simulated annealing and random algorithm.
Keywords: learner machine, grid, pso_ sa, pso_la, swarm intelligence algorithm

1. INTRODUCTION

In Grid computing systems, failure probability increases in these systems due to dynamic and distributed nature of grids. Therefore, error tolerance is a crucial field in computing grids, and it affects reliability. Grid is a kind of parallel distributed system providing selection and gathering non-heterogeneous distributed resources in execution time, and it is on the basis of some factors involving accessibility, capacity, efficiency and output, costs, users needs of service quality. There are many programs in grid environment, and they must be scheduled on these systems for parallel execution. Since scheduling is a NP-hard problem, we can use evaluation algorithms to solve it such as random or GA algorithm.

In computing systems, grid has been emerged as a new and important field, and it is different from distributed system due to resources subscription and creative application programs with high efficiency and performance.

Grid computing system is a kind of distributed system with wide range. The main problem of grid is to coordinate resource subscription, solving the problem dynamically and multi-distribution program. Subscription that Grid computing involved with was not only file primary exchange, but also direct accessibility to computers, software data and other sources which needed a broad spectra of problem solving strategies and resource subscription. Therefore, Grid computing reliability influenced by the relation between computing programs and important sources. [1]

Since scheduling problem is NP-hard issue, and resource management and scheduling have effective role in load balance, it influences grid efficiency [2]. The advantages of computing grid is as follows: using the resources, parallel computing, creating resources and virtual organization, management of accessing to additional resources [3].

Since artificial intelligence algorithms are efficient in optimization problems, they are considered as a good choice to solve some problems like load balance in distributed system. The purpose of load balance is to reduce the difference of load rate between the heaviest node and the lightest node [4].

2. LITERATURE REVIEW

Load Balance algorithm divided into different groups. On one hand, these algorithm divided into two groups static and dynamic. Load balance difference in dynamic and static mode is that in static mode the decisions related to load balance made in compiling time but in dynamic mode decisions related to load balance made in performing time.

It means that in static mode, indeed, these decisions made in the time of request for the source. And in dynamic mode, behavior of balancer varied according to parameters and policies changing. [5]

Load balancing divided into three groups; concentrated, non – concentrated and hierarchy in concentrated method, all functions scheduled by a scheduler and scheduling operation performed by the applicant source and in hierarchy method the scheduler organized in the hierarchy form. [6]

In load balance concentrated method, many studies have been conducted. In [5] in order to have concentrated load balance, genetic algorithm used and its Simulation result compared with Min – Max and Max – Min algorithm. In [2] a new genetic algorithm presented using resource fault occurrence history (rfoh) for certain scheduling in computing Grid.

This strategy keeps source fault occurrence history in Gird information server. One of these algorithms is particles swarm intelligence (pso) that is a solution for optimization problems in search apace with modeling of social behavior. A new model is proposed on the basis of PSO called PSO-SA.

In fact, simulated annealing algorithm is one of the most well-known algorithms in artificial intelligence algorithm. This algorithm was proposed by Scott Kirkaptrica in 1983. One of its applications is to solve optimization problems. In this algorithm, an arbitrary point is firstly selected from search

space, and penalty function is computed. Then, a point is selected as next point for substitution. The function is defined as follows. If heat is high, then the probability of moving toward energy increasing will increase.

Simulation results showed that proposed strategy decreased total time of programs performance. One of glowworm algorithm advantages relating to other swarm intelligence algorithms is its constriction simplicity.

Firefly Algorithm is a type of algorithm obtained from nature and collective smart algorithm which presented by yang (2008), this algorithm is a modern technique based on collective behaviors which inspired from firefly collective intelligence is a type of artificial intelligence method social behaviors in the nature based on collective behaviors in neutralized and self-organized foundations. Fireflies generate rhythmic and short beams. Optical patterns of each firefly differentiated form others. Fireflies used these beams for two reasons. 1- pairs attraction process. 2- for attracting hunt. Moreover, these beams used as a protective Mechanism for fireflies. Rhythmic beams and rate of radiation and interval rate between light signals caused two genders attract each other. Any particle of a firefly in multidimensional quest space updated by absorbing dynamically based on a knowledge of firefly and its neighbors.

Firefly optimization algorithm could be stated as follows: [7]

* all fireflies are single- gender and the factor of pairs attractiveness considered not relating to their gender.

* firefly x attracts all fireflies and attracted for all fireflies.

* attractiveness is related to their glow, so for any pair of firefly, a worm with less light is attracted toward a worm with more light. Attractiveness power related to their beam and the light intensity decreased by increasing the distance between two fireflies. If a firefly is not brighter than the others, their movement will be performed randomly.

* brighter firefly moves randomly (all fireflies could not attract them).

* firefly brightness is determined by objective function value. In maximization problem, light intensity can be easily determined by target function.

* firefly particles ae randomly distributed in quest space. According to above principles, there are two main parts in firefly algorithm, attracting firefly and movement toward attracted firefly.

2.1 General Form Of Firefly Algorithm

General form of firefly algorithm has been shown in the figure (1)As we can see in the figure, at first, primary coordination and light intensity rate and the distance between firefly particles are determined in quest area. Quest procedure in firefly algorithm is that any firefly isindividually compared with others. If a firefly has less light than the compared one, it will move toward a firefly with more light (the problem of finding maximum point), and in this process, particles are centralized around a particle with more light, and if in the next generation of algorithm, there is a particle with more light, particles will move toward particle with more light again. Quest stages must be generated relating to maximum number of generation. In this study, in order to optimize the problem of load Balance by using glowworm group intelligence algorithm, a solution is presented. In this method, each node in the network is considered as a glowworm. Each glowworm tries to optimist existing load rate in itself, and this work is performed by exchanging the load among other nodes.

3. PROPOSED ALGORITHM

Gglowworm algorithm has been explained in the previous sections. In algorithm presented based on swarm intelligence, all nodes in Grid system are considered as a solution for finding the most optimized mode.

The location of each worm is shown by the existing rate of light. In order to determine attraction parameter for any node, its node light rate difference is measured with neighbor nodes. Any node always moves toward the best neighbor. This work is performed by attracting toward the neighbor or emitting more light from neighbor nodes during the same rate of a node light with the same rate of a node light with the neighbor nodes, its movement performed randomly. since grid is a dynamic environment, solutions always change so that, in this method, there is no need to keep information and previous history like classic glow worm, and also we have no massive particles. In this study, parameter α , β considered. 1 and 2 between 0 to 1

```
Particle Algorithm()
 sourceLoad
while running
Do if job Queue.size>0
Then
Lighteload    %% choose best Neighbor(entekhab avalin behtarin)
SecondLightestLoad   %% choose SecondLightest Neighbor(en entekhab dovomin behtarin)
TC (kamtarin hazine tebghe kamtarin faseleh)
threshold(tebghe avalin va dovomin)
while tc>threshold
do
Submit jobs      %%(TC)
sourceLoad       %%(currentNodeload)
velocity          %%(sourceload- lightestLoad)
```

Figure 1: Running Algorithm by using glow worm.

3.1 simulation Results

After simulating the proposed algorithm in MATLAB environment, results are compared with massive particles and genetic. The way of constructing the network topology for the simulation is as follows:

At first, a minimum covering tree is structured; then, considered topology is obtained by adding edges. In figure (2) time of the first job sending to the network until reaching the last job has been compared. The group showed that glowworm algorithm application relating to other algorithm will be more optimized.

In the figure (3) the difference between lightest and heaviest nodes has been demonstrated in terms of its load. (the load in glow worm shows itself by light, and due to much similarity with massive particles, we showed job comparison with this algorithm. This time consisted of the first job sending time until running the last job in the network.

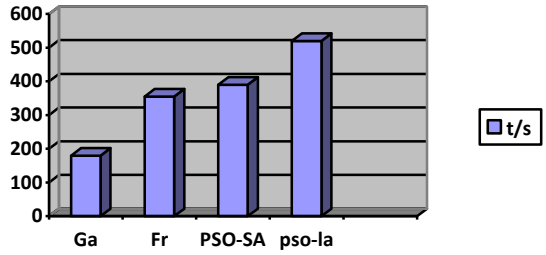

Figure 2: executing algorithm by using glowworm algorithm

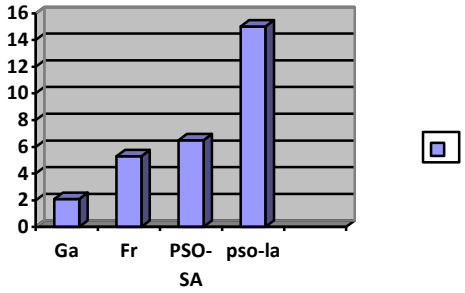

Figure 3: the average of executing time in different algorithm

4. CONCLUSION

In this study, we used glow worm algorithm for load balanced in Grid. Results showed that this algorithm has higher efficiency than other algorithms in terms of job scheduling when there are different sources. Since grid computing system is considered as a computing system with a large scale, communication and processing time cannot be ignored. The features of grid computing system have been described in this paper, and reliability of grid computing system and program has been analyzed. In addition, algorithm has been presented to evaluate reliability of grid system and program. Glow worm algorithm showed better results for the time of running and also considered as the most appropriate component of methods for optimization problems.

5. REFERENCES

[1] Dai .Y.S, . Xie. M, Poh .K.L. (2010),.," Reliability Analysis of Grid Computing Systems", Department of Industrial and System Engineering, National University of Singapore.

[2] Mohammad Khanli. Leyli, Etminan Far . Maryam, Ghaffari . Ali. 2010," Reliable Job Scheduler using RFOH in Grid Computing", Journal of Emerging Trends in Computing and Information Sciences CIS Journal. All rights reserved.

[3] Cao. J, Spooner. D. P, Jarvis. S. A, Nudd.v.,(2005)._Grid load balancing using intelligent agents. Future_Gener. Comput. System.

[4] Grosan. C, Abraham. A, and Helvik. B. (2007).Multiobjective evolutionary algorithms for scheduling jobs on computational grids.ADIS InternationalConference, Applied Computing, Salamanca,Spain, Nuno Guimares and Pedro Isaias (Eds).

[5] Subrata. R., Zomaya. A. Y, and. Landfeldt. B(2007). Arti_cial_ life techniques for load balancing in computational_grids. J. Comput. Syst. Sci.,

[6] J. K. J and. Eberhart. R. C,(2001). Swarm Intelligence._Morgan Kaufmann Publishers

[7] J. K. J and R. C. Eberhart. Swarm Intelligence._Morgan Kaufmann Publishers, 2001.