A Review of Literature on Task Scheduling In Cloud Computing

S.Krishnaprasad\(^1\), Dr.P.Srivaramangai\(^2\)

\(^1\) Ph.D.Research scholar, Department of Computer Science, Maruthu pandiyar College of Arts & Science, Thanjavur, Tamilnadu, India.

\(^2\) Associate Professor, Department of Computer Science, Maruthu pandiyar College of Arts & Science, Thanjavur, Tamilnadu, India.

Abstract - The cloud environment is essential utilization of a dynamic, heterogeneous and complex environment. One of the fundamental risks in this environment is related to task scheduling. Cloud task scheduling is an NP-hard optimization problem, and several meta-heuristic algorithms have been proposed to solve it. In scheduling strategy, a task scheduler must adapt to the modifying environment and various kinds of tasks. The ant colony optimization (ACO) algorithm was adapted on machine capacity and performance from social theories with a fair and accurate resource allocation approach, to resolve the task scheduling trouble in cloud computing. In this process, we evaluate and illustrate a Cloud scheduler depending upon Ant Colony Optimization (ACO).

Keywords - Cloud Computing, Task Scheduling, Resource Allocation, Ant Colony Optimization

I. INTRODUCTION

Cloud Computing is an effective model for hosting and conveying services on the internet. Latest computing technology plans to afford quality of reliable service for user utilization [1]. Cloud computing organization deals with large amount of data, large scale and the demand of computing power, need to improve system investment. Nowadays IT field is one of the efficient technologies to be popularized. Several modifications in the computing industry by reason of the cloud computing and it is an extension of Grid computing, parallel computing and Distributed computing. The US National institute of standards and Technology states that cloud computing is a model to shared computing resource for on demand network access [2]. In distributed computing, it delivers infrastructure software as services platform for on demand network access. It assists user applications provider for utilizing dynamic services such as secure, rapid process, large scalable, virtualized resources and data storage over internet. The main goal of cloud computing is economically utilized those customers only use when required and only pay for actual usage and these resources are available in the cloud every time to be accessed from anywhere through the internet services [3]. To increase the maximum utilization development from cloud computing, developers have to design mechanisms that optimize the use architectural and deployment [4]. Virtual Machine plays a vital role in cloud computing because whole work of cloud related to the virtual machine with the support of the hardware and software. The user can utilize the powerfully computing services and its advantages only get when it is connecting to the internet that provides services according to user requirement. Virtualization affords technical support for performing virtualization technology and cloud computing applications.

In computing, scheduling is that the technique by which work specified by some means that is allotted to resources that complete the work. It may done by virtual computation elements like processes or data flows, threads that are in turn scheduled onto hardware resources like network links or expansion cards, processors. A scheduler takes out the scheduling activity and then implemented all computer resources busy (the same as in load balancing), enable multiple users to achieve a target quality of service, or to share system resources in an effective manner. In scheduling concept, it makes possible due to computer multitasking process by utilizing a single central processing unit (CPU).

In scheduler process, it may aim at one of several goals, for that case, minimizing response time (time from work becoming enabled until the first point it starts execution on resources), or minimizing latency (the time between work becoming enabled and its subsequent completion), maximizing throughput (the total amount of work completed per time unit), or maximizing fairness (more generally appropriate times or equal CPU time to each process, according to the workload and priority of each process).

Thus, Task scheduling is a vital part in cloud computing and it is handles a mechanism that maps user task with appropriate resource [5]. Task scheduling is a well-known NP-hard problem and also it is the main aim of cloud computing to achieve with optimal results. Applications...
require high availability, fault tolerance and scaling to run uninterrupted for utilizing long periods of time.

Process of task scheduling generally includes:
- Task Execution
- Task Waiting Time
- Task Submission
- Resource Allocation and
- Resource Identification

The major goal of task scheduling is maximizing the utilization with minimization of task execution time (TET) on the processor distributing load [6]. All the tasks received per unit time is known as the makespan for executing the total time taken. Three main concerns behind task scheduling are execution cost and makespan better system throughput [7]. The main benefit of scheduling algorithm is to acquire a high performance. The most important examples of scheduling algorithms are Ant Colony Optimization (ACO), Minimum Execution Time (MET), Minimum Completion Time (MCT), Min-Min, Max-Min and meta-heuristic algorithms Particle Swarm Optimization (PSO), Cat Swarm Optimization (CSO), Genetic Algorithm (GA), Round Robin (RR), Bee Colony Optimization (BCO), First Fit (FF), Opportunistic Load Balancing (OLB), Simulated Annealing (SA), Tabu Search.

A better task scheduler must adapt its scheduling strategy to the kinds of tasks and the changing environment. Thus, a dynamic task scheduling algorithm, like Ant Colony Optimization (ACO) [8], is appropriate for clouds. The pheromones of the particular journey are improving while more bugs are well tracking about this to obtain the shortest one. ACO techniques are helpful for resolving a discrete optimization problem which is needed to find shortest paths to target [8].

Basic Concept of the Ant Colony:
- The ants walk travels from and to the nest to find the food source when depositing a substance known “pheromone” on their path.
- It influences the choice of their paths as they tend to follow stronger pheromone concentrations, before then other ants are capable to smell this pheromone.
- This allows other ants to find the sources of food that have previously been identified by their colony ants. The pheromone deposited on the ground forms the pheromone trail.
- At few specific rate of evaporation, the pheromone keeps on evaporating with timely manner.
- The ant initially choosing the shorter path and then the first one to return to the nest. The ant choosing the same shorter path on its return journey and this is due to a very high probability (as it has stronger pheromone trail).

- Finally, after few minutes, whole the colony ants converge to follow the shortest path.

II. LITERATURE REVIEW

Mandeep Kaur, et al. [9] GAACO algorithms proposed, load balancing of resources across virtual machines is the fundamental issue of Cloud Computing. GA is optimization techniques and review search in many practical risks, due to locate the global maximum in a multimodal landscape. Although, GA may not guarantee for global optimization solution after that utilize ant colony optimization strategy of GA, but ant colony suffers from bad converge speed. Hybridization of GA and ACO adopted with multi-objective function that is ignored in the existing work. Thus, a multi-objective hybrid genetic algorithm-ant colony optimization (GAACO) is clearly proposed to improve above limitations.

Namrata Goswami, et al. [10] proposed ant colonies approach for improving parameters. A latest computational paradigm is known as Ant Colony Optimization (ACO) algorithm that aims to improve performance parameters such as throughput and response time in cloud environment. Presently, the proposed algorithm applied utilizing the CloudSim simulator. As the results of the simulation illustrate that the response time is saved and throughput increased compare than the Basic ACO (Ant Colony Optimization). To improve load balancing performance parameters in proposed algorithm for performing resource utilization and better performance in cloud environment.

Xiao-Fang Liu, et al. [11] proposed the algorithm ACO-VMP, Cloud computing affords resources as services in pay-as-you-go mode to customers by utilizing this virtualization technology. Enormous energy is consumed by maintaining the servers in data center, as virtual machine (VM) is hosted on physical server. In physical servers, it means more cost expense and more energy consumption. Thus, the VM placement (VMP) issues is significant in cloud computing. ANT colony optimization (ACO) is to resolve the VMP issue, named as ACO-VMP, so as to reduce the number of running physical servers and to effectively use the physical resources.

Zhang Yan-hua, et al. [12] discussed a cloud database route scheduling algorithm according to the dynamic combination of the ant colony algorithm and genetic algorithm. The Genetic Algorithm is transformed into the pheromone with initial value that is required by ant colony algorithm, after then the optimal solution by the ant colony algorithm was obtained. The opportunity of two algorithm’s fusion was set up to control by Genetic control function. A reasonable algorithm is proposed to search the needed database effectively and rapidly, improve the efficiency of cloud computing, and reduce the dynamical load of cloud database.
routing. The dynamic combination of the ant colony algorithm and genetic algorithm combines with the searching in cloud database, and better results has obtained. The author acquires good simulation result after comparing the fusion algorithm with the ant colony algorithm. Next research direction due to minimize the search time, low searching costs, optimize search performance and compare than other routing algorithm.

Srinivasan Selvaraj, et al. [13] referred cloud scheduling tasks to perform by utilizing ACO algorithm and its aims to compare the performance with the First Come First Serve (FCFS). The ACO algorithm outperforms the FCFS algorithm by using simulation results. The ACO algorithm provides an optimal makespan and rapid convergence for utilizing cloud scheduling process. To improve the performance of the ACO algorithm is compared with FCFS algorithm in terms of total execution time and makespan. Additionally, the major impact of number of ants is also referred and emulation results prove that the ACO algorithm outperforms the FCFS algorithm.

Nie Qingbin, et al. [14] proposed the cloud computing utilization to improve an Ant Colony Optimization (IACO). IACO algorithm improves that inspired factors and pheromone factors innovatively depending on the existed algorithms. Emulation tests are performed in the CloudSim simulator. The well advanced ant algorithm IACO totally based on cost, time and load balance is referred in this paper to optimize task allocation in cloud computing. Finally, test results illustrate that IACO is superior to IABC and ACO is saving cost and processing time and optimizing resource utilization rate in the cloud system.

Elina Pacinia, et al. [15] suggested private clouds to execute scientific experiments from multiple users, which work focuses on the Infrastructure as a Service (IaaS) model and where custom Virtual Machines (VM) are launched in appropriate hosts available in a Cloud. Subsequently, a cloud host is suitably scheduled and it is essential to develop efficient scheduling strategies to correctly assign VMs to physical resources. However, the job scheduling problem is NP-complete optimization and then several heuristics have been developed. The author evaluates and describes a Cloud scheduler depending upon Ant Colony Optimization (ACO). Our scheduler succeeds in balancing the studied metrics compared with schedulers depending upon Genetic Algorithms and Random assignment, before that simulated experiments performed for utilizing CloudSim and job data from real scientific problems illustrate that.

Weifeng Sun, et al. [16] proposed tasks scheduling process in cloud computing utilizing a self adaptive ant colony optimization. SAACO has a better performance according to the self adaptability of the ACO parameters and find the new way to calculated and update the pheromone. SAACO executes better than PACO before that utilize both load balance and makespan based on the simulation experiments results, which acquires better performance in cloud computing tasks scheduling. But, there are few details about the author must pay attention to, in order to enhance the performance. The author uses the standard value and doesn’t consider these in elaborate detail so that the main issue for the parameters of PSO-part in SAACO.

Kumar Nishant, et al. [17] A modified approach of ant colony optimization referred that applied the main aspire for load balancing of nodes from the perspective of grid or cloud network systems. The main advantage of this approach lies in its detections of overloaded and under loaded nodes and in that way performing operations depending on the identified nodes. By the ants tracks its path subsequently in search of different types of nodes, after that this simplistic approach elegantly performs our task of identification of nodes. Ant colony optimizations have utilized the same concepts and only modified the concepts where trailing and forward pheromones are used according to our convenience. However, in this approach the ants constantly update a result set more willingly than updating their own result set. In this way, the solution set is progressively built on and constantly improved upon rather than being compiled only once in a while. The other benefit of the approach lies the task depends on the type of first node and the task of each ant is specialized rather than being general that was encountered whether it was under loaded or overloaded.

Kun Li, et al. [18] proposed a cloud task scheduling policy depending on Load Balancing Ant Colony Optimization (LBACO) algorithm. The entire system load is to balance while trying to minimizing the makespan of a given tasks set that has to consider the main contribution of our work. Tests results illustrated the proposed the basic ACO (Ant Colony Optimization) and LBACO algorithm outperformed FCFS (First Come First Serve) and the new scheduling strategy was simulated using the CloudSim toolkit package. LBACO algorithm is experimentally evaluated with the number of tasks varying from 100 to 500. The LBACO algorithm evaluates for performing tasks scheduling with load balancing. The entire system load is effectively performed the LBACO balance by referring the experimental result. LBACO can handle all conditions, and ACO algorithms and outperforms FCFS in cloud computing environment, if check whether the sizes of the tasks are the same or not during evaluation.

Shengjun Xue, et al. [19] this paper proposes aiming at the defects of the ACO-LB algorithm and the load imbalance of virtual machine in the process of task scheduling. To improve ant colony optimization scheduling algorithm can not only

IJSRCSAMS

Volume 7, Issue 5 (September 2018)  www.ijsrscams.com
find the shortest path of the execution time of tasks and that is followed by simulation results, however, also can adjust the number of tasks allocated to virtual machines consistent with computing capability of them. Load of virtual machines can moderately avoid the resource wastage and balanced state and other risks. Moreover, the ACO-LB algorithm can efficiently provide and enhances the utilization rate of resources and appropriate resources for tasks.

Preeti Kushwah, et al. [20] presented work the computational cloud is investigated for their efficient resource allocation and resource scheduling strategy. The modified ACO algorithm prepare to generate a Fvalue. By using the mean fitness value of generated solutions and using this value the entire solutions are recomputed after combining them. Therefore, ACO (ant colony optimization) algorithm is explored and investigated, after that a modified ACO algorithm is recommended for improving the ACO algorithm that is utilized for allocation of jobs and resource scheduling. The ACO based scheduling algorithm is performed within CloudSim simulation tool and utilizing JAVA technology. The proposed algorithm is used for implementation of the desired simulation and compared with two inbuilt algorithms, named as space shared and time shared. The technique is also compared with the machine learning based traditional ACO algorithm and back propagation algorithm. All implemented algorithms are compared in terms of space complexity and time complexity and their scheduling performance.

Arabi E. et al. [21] proposed ANT algorithm for performing online cloud task scheduling depending upon reliability and load balancing. The proposed algorithm selects suitable resources to execute tasks according to resources status like reliability and load balancing and the size of given task in the cloud environment. The proposed idea is a better option to be utilized as a fault tolerance mechanism and the load balancing of cloud computing virtual machines. On the basis of VM algorithm reliability that has incorporated the concept of fault tolerance. Decision mechanism of the proposed algorithm illustrates convergence towards the virtual machine which has a guided load balancing factor to balance the load on available virtual machines with the highest reliability. The simulation experiment results show that the proposed algorithm enhances the performance in terms of reduction in the degree of imbalance and total execution time.

Priyanka Mod, et al. [22] the proposed resource scheduling algorithm exploits the ACO (Ant Colony Optimization) algorithm for resource management and scheduling. The resource implementation scheduling technique is performed using JAVA environment, with the support of CloudSim simulator, after implementation of desired technique the performance of algorithm is computed in terms of algorithm performance and computational efficiency. The presented resource scheduling algorithm improves the performance of computational cloud. The computation efficiency is evaluated for indicating the algorithm performance and the resource scheduling performance that specifies the space complexity and time complexity of the system, after that evaluated results show the effective outcomes form the system. The commutated performance of the system is compared with the memory based scheduling technique and time based resource scheduling technique as previously. Afterward, the evaluated performance of the system is precisely defined using a performance summary Table.

Er. Partibha Rani, et al. [23] referred all the relevant parameter have shown the hybrid GSA and ACO approach for performing the better results relative to basic ACO. It provides rid of local convergence limitation of ACO by combining the GSA with ACO. Hybrid approach relative to basic ACO approach reflected through less makespan, better resource utilization, and higher load balancing. Additionally, the proposed approach is distributed in nature and it suited for a distributed environment like cloud. While future scope authors have prepared to test it on more parameters and test it in the real cloud environment by comparing it with more task scheduling schemes.

Rahul Upadhyay, et al. [24] presented from this paper a dynamic pre allocation with self adaptive ant colony optimization technique for performing more efficient task scheduling in cloud computing. Proposed technique exploit pre allocation of task by utilizing self adaptive and dynamic distribution makes it more efficient. Stimulation results have quick response time and better makespan time over existing techniques for proposed DPSACCO. The new way to evaluated and update the pheromone according to the self adaptability of the ACO parameters, after that DPSAACO has an excellent performance.

Kumar Nishant, et al. [25] described an Ant Colony Optimization has been connected with the primary point of Load Balancing of nodes from the point of view of cloud. A cloud is the collecting of numerous nodes, which can strengthen different sorts of application that is used for each utilization by the customers on a premise of pay. This modified algorithm has an edge over the initial approach in every ant makes their own particular individual result set and it is later on assembled into a complete arrangement. In this proposed approach, the ants frequently update a single result set sooner than updating their own result set. Because the cloud supports different kinds of application that is utilized by the clients on a basis of pay peruse. Thus, such a system must function smoothly performing and also have algorithms.
that can keep on the proper system functioning during the peak hours.

Mishra Ratan, et al. [26] purposed to generate an effective Load Balancing algorithm by using Ant Colony Optimization technique to increase or decrease different performance parameters such as Memory capacity, Delay or network load, CPU load for the clouds of different sizes and also clarified the working of a load balancer that what the various phases and how it works of the load balancer. A heuristic algorithm is suggested that is dependent on Ant Colony Optimization.

Harshada Raut, et al. [27] presented Ant Colony Optimization algorithm with travelling salesman risk. It is broadly studied and one of the well-known issues in combinational or discrete optimization and requests for the shortest round trip of total minimal cost visiting each node. While server gets overloaded the solution for finding the minimum distance from one node to adjacent nodes. It saves the time if the same request has already been executed on the same node and then the temporary memory to store the previous executed requests.

Acharya Mitali Niles, et al. [28] studied and investigated the make use of of swarm intelligence technique Ant Colony Optimization (ACO) for designing an approach of load balancing in cloud systems. The proposed ACO algorithm is applied for utilizing CloudSim simulator and compared performance of the algorithm with Basic ACO. To summarize, this paper introduces swarm intelligence technique Ant colony optimization for load balancing and scheduling and illustrates its advantages in dynamic and distributed load balancing domain.

III. CONCLUSION

Ant Colony Optimization (ACO) is a well known technique and quickly developing meta-heuristic technique. Load Balancing is the one of the most important features in the Cloud Computing that precedes the center of attention on distributing the load over the available virtual machines. We have taken inspiration from ant colony systems for designing an approach of load balancing in cloud systems. A huge number of optimization issues have already taken advantage of the ACO technique while countless others are on their way. This paper proposed a literature survey of ACO algorithm and then they utilized ACO to resolve the multi-objective optimal-path selection problem.

REFERENCES

[12]. ZhangYan-hua, FengLei, YangZhi,“Optimization of Cloud Database Route Scheduling Based on Combination of Genetic Algorithm and Ant Colony Algorithm”, Volume 15, 2011, Pages 3341-3345.
[18]. Kun Li, Gaochao Xu, Guangyu Zhao, Yushuang Dong, Dan Wang, “Cloud Task scheduling based on Load Balancing Ant Colony Optimization”, IEEE DOI 10.1109/ChinaGrid.2011.17


