

Task Scheduling using Genetic Algorithm in Cloud Computing Environment: A Review

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Abstract— Cloud computing is the new paradigm for delivering on demand services over internet and can be described as internet amiable software. Task scheduling is one of the major activities performed in all the computing environments. Cloud computing is one the upcoming latest technology. Task scheduling is a critical problem in Cloud computing, because a cloud provider has to serve many users in Cloud computing system. So scheduling is the major issue in establishing Cloud computing systems. A good scheduling technique also helps in proper and efficient utilization of the resources. In the given paper, the special devotion has been given to the different types of scheduling algorithms. The main focus is to study various problems, issues and types of the task scheduling based on the genetic algorithm in cloud computing environment.

Index Terms—Task Scheduling, Genetic Algorithm(GA), Virtual Machine(VM), CloudSim, Cloudlet.

I. Introduction

Cloud computing is an on demand service in which shared resources, information, software and other devices are provided according to the clients requirement at specific time. It's a term which is generally used in case of Internet. The whole Internet can be viewed as a cloud. Capital and operational costs can be cut using cloud computing. In case of Cloud computing services can be used from diverse and widespread resources, rather than remote servers or local machines. There is no standard definition of Cloud computing. Generally it consists of a bunch of distributed servers known as masters, providing demanded services and resources to different clients known as clients in a network with scalability and reliability of datacenter. The distributed computers provide on-demand services. Services may be of software resources (e.g. Software as a Service, SaaS) or physical resources (e.g. Platform as a Service, PaaS) or hardware/infrastructure (e.g. Hardware as

example of cloud computing services [1]. There are many papers that addresses the problem of task scheduling in traditional distributed systems like grids, there are only some distributed systems works in clouds. The scheduling problem is very critical problem in clouds.

II. Algorithm and Metrics

In this section, we present a more comprehensive and critical survey of scheduling algorithms based on genetic algorithms in cloud computing environment and these algorithms have been summarized in Table. The existing scheduling algorithms consider various parameters like cost, makespan, speed, scalability, throughput, resource utilization, scheduling success rate and so on.

a Service, HaaS or Infrastructure as a Service, IaaS). Amazon EC2 (Amazon Elastic Compute Cloud) is an

ALGORITHM	DESCRIPTION	PARAMETER	TOOL
An improved Genetic algorithm with limited iteration of Grid Scheduling[2].	This paper presents an improved genetic algorithm for scheduling independent tasks in grid environment, which can increase search efficiency with limited number of iteration by improving the evolutionary process while meeting a feasible result.	Number of Iterations, Population size, Crossover and mutation proportion.	Java Genetic Algorithms Package
Improved Genetic Algorithms and List Scheduling Techniques for Independent Task Scheduling in Distributed Systems[3].	This paper considers new heuristics for both the LS(List Scheduling) and the GA paradigm with the specific aim of improving the performance of the standard algorithms when task computations involve large data transfers. Experimental results under various environment assumptions illustrate the merits of the new algorithms.	Data size, Execution time, Processing nodes	GA based Task Scheduling Model
Independent Task Scheduling based on Genetic Algorithm in cloud computing[4].	This paper proposes an optimized algorithm based on genetic algorithm to schedule independent and divisible tasks adapting to different computation and memory requirements. Though GA is designed to solve combinatorial optimization problem, it's inefficient for global optimization. So we conclude with further researches in optimized genetic algorithm.	Number of Iterations, Population size, Crossover and mutation proportion.	Not Implemented
Genetic Algorithm for Grid Scheduling using Best Rank Power[5].	This paper proposes an Roulette Wheel Selection Genetic Algorithm using Best Rank Power(PRRWSGA) for scheduling independent tasks in the grid environment. The modified algorithm speeds up convergence and shortens the search time more than IRRWSGA, at the same time the heuristic initialization of initial population using MCT algorithm allow the algorithm to obtain a high quality feasible scheduling solution.	Population size, max. generations, max. trails, crossover rate, mutation rate.	Linux Operating System and MATLAB.
Genetic Simulated Annealing Algorithm for Task Scheduling based on Cloud Computing Environment[6].	This paper introduces an optimized algorithm for task scheduling based on genetic simulated annealing algorithm in cloud computing and its implementation. Algorithm considers the QoS requirements of different type tasks. The algorithm efficiently completes tasks scheduling in the cloud computing environment.	Population size, crossover probability, mutation probability, initial annealing temperature, temperature cooling coefficient and maximum generation.	CloudSim
An optimistic Job Scheduling Strategy based on QoS for cloud computing[7].	The Cloud Computing is promoted by the business rather than academic which determines its focus on user applications. Different users have different QoS Requirements. So according to the given deadline and budget, this paper conducts research on scheduling model from the user's perspective.	Number of jobs, time and cost	Not Implemented

ALGORITHM	DESCRIPTION	PARAMETER	TOOL
Independent Task Scheduling in Cloud Computing by Improved Genetic Algorithm[8].	This paper proposes a new scheduling algorithm which is an improved version of Genetic Algorithm. In the proposed scheduling algorithm the Min-Min and Max-Min scheduling methods are merged in standard Genetic Algorithm. Min-Min, Max-Min and Genetic Scheduling techniques are discussed and in the last the performance of the standard Genetic Algorithm and proposed improved Genetic Algorithm is compared and is shown by graphs.	VM & Cloudlets	CloudSim
An Efficient Approach to Genetic Algorithm for Task Scheduling in Cloud Computing Environment[9].	This paper proposes a meta-heuristic based scheduling, which minimizes execution time and execution cost as well. An improved genetic algorithm is developed by merging two existing scheduling algorithms for scheduling tasks taking into consideration their computational complexity and computing capacity of processing elements. Experimental results show that, under the heavy loads, the proposed algorithm exhibits a good performance.	Cloudlet, Makespan & Cost	CloudSim
Genetic Algorithm for Multiprocessor Task Scheduling[10].	This paper describes multiprocessor task scheduling in the form of permutation flow shop scheduling, which has an objective function for minimizing the makespan. Here, we will conclude how the performance of genetic algorithms (value of the makespan of the schedule) varies with the variation of Genetic Algorithm (GA) control parameters (population size, crossover probability and mutation probability).	Number of jobs, Processors, Makespan	MATLAB
Job Scheduling Model for Cloud Computing Based on Multi-objective Genetic Algorithm[11].	This paper describes a solving method based on multi-objective genetic algorithm (MO-GA) is designed and the research is focused on encoding rules, crossover operators, selection operators and the method of sorting Pareto solutions. Based on open source cloud computing simulation platform CloudSim, compared to existing scheduling algorithms, the results show that the proposed algorithm can obtain a better solution, and it provides a balance for the performance of multiple objects.	Power, Frequency, Memory & Amount	CloudSim
A Pareto-based Genetic Algorithm for Optimized Assignment of VM Requests on a Cloud Brokering Environment[12].	This paper describes the cloud brokering for the assignment optimization of VM requests in three-tier cloud infrastructures. The Pareto-based meta-heuristic approach is to take into account multiple client and broker-centric optimization criteria. A new multi-objective Genetic Algorithm (MOGA-CB) is proposed that can be integrated in a cloud broker.	Arrival rate, execution time, Satisfaction rate and profit rate	Manual Calculation

III. Conclusion

In this paper, we have presented a rather extensive survey on the various existing task scheduling based on genetic algorithms in cloud computing environment and tabulated their various parameters along with tools and so on.

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