

# Task Scheduling Using Meta-Heuristic Optimization Techniques in Cloud Environment

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**Abstract:** *Cloud computing provides various services for the resource allocation like computation, storage in a virtualization. The virtual machine in cloud, allocate the job and schedules the task efficiently. The task scheduling and resources utilization are the key issues in the cloud environment. Scheduling allocate different types of job in the resources. Scheduling is decided based on the feedback of the Quality of Services (Qos). Quality of Service is the guaranteed service which handles the different task in the job allocation. Therefore, in order to schedule the intensive data, numerous heuristic algorithms have been recommended such as Particle Swarm Optimization (PSO), Genetic Algorithms (GA), Ant Colony Optimization Algorithms (ACO), Artificial Bee Colony Algorithms (ABC), to solve the task scheduling and resource matter. This project proposes a Bat Algorithm to solve task scheduling and resource allocation problem in cloud computing. The Bat algorithm is implemented to enforce a better efficient scheduling mechanism which will increase the performance and efficiency of the system by minimizing the execution time (makespan), execution cost, deadline and load balancing. This service is used to complete the task as soon as possible without any delay in task scheduling.*

Keywords: Cloud Computing, Virtual Machine, Meta-heuristic, Task Scheduling and Resources Utilization.

## 1. Introduction

Cloud computing is a representation for enable ever-present network access to a shared pool of configurable computing resources. It will share the resources to accomplish unity and economies of scale, similar to a utility over a network. Under the cloud computing, multiple users can right to use on its own server to retrieve and update their data without purchasing license for dissimilar function. Proponents assert that cloud computing allows companies to avoid upfront infrastructure expenditure, and focal point on projects that distinguish their businesses instead of an infrastructure. Virtualization is the ability to run various operating systems on a particular physical system and share the underlying hardware resources.

Virtualization is used to develop the throughput and costs by using physical resources as a pool from which virtual resources can be allocated. Virtualization technologies are used by countless thousands of companies to consolidate their workloads and to make environments scalable and more flexible. A Virtual machine (VM) is an isolated runtime environment (guest OS and applications).

A diverse range of research issues is addressed in cloud by different constraints task scheduling, workflow scheduling. To achieve the given constraints different optimization techniques have been used. The main aim we focus is to minimize the makespan, execution cost, deadlines and load balancing.

The section proceed with related work, is described in section 2 followed by the survey on existing optimization algorithm with different constraints in section 3 and section 4 conclusion of the paper.

## 2. Related work

Shaminder Kaur and Amandeep Verma [1] explained with Genetic Algorithm (GA) for scheduling the task in the cloud services to the users. The main aim is to minimize the execution time and execution cost based on the Meta –heuristic scheduling. The solution is to achieve the minimum time compared with existing. Cloudsim is the simulation has been done under this technique. The experimental result of algorithm is to provide a good performance even under the heavy loads.

Amandeep Verma and Sakshi Kaushal [2] stated about “Deadline and Budget distribution-based Cost-Time Optimization algorithm” is to provide a good efficiency. The proposed algorithm is used for minimizing the execution cost while meeting its timeframe. They will use different constraints to achieve its goal by using the proposed algorithm. The experimental result of this algorithm is partitioned as overall deadline and budget partitioning optimized execution planning and efficient run-time rescheduling.

Ram Singar Yadav and Meenu [3] delivered with Genetic algorithm for testing different population sizes, cross over rates and mutation rates. This algorithm is used to minimize the makespan and inversions perform for different task and scheduling. The results it is clear that more population size is required to have minimum makespan using cross over with inversion. The experimental result is at higher values of cross over rates, the search & optimizations are found improved comparatively.

Amandeep Verma, Sakshi Kaushal [4] published a Deadline constrained Heuristic based Genetic Algorithm (HGAs) for minimizing the execution cost while meeting its deadlines. They handled with the different workflow scheduling by knowing its structure and size. They provide a comparison between the priorities to create the population. Cloudsim is

used provide a stimulation to give an optimal solution for the proposed work.

Shengjun Xue, Mengying Li, Xiaolong Xu, Jingyi Chen [5] projected with Load balancing optimization algorithm based on Ant colony algorithm (ACO-LB) to obtain a load balancing in virtual machine. They have been used with the load balance and makespan .It performs with optimization algorithm in that the workflow scheduling is simulated in Cloudsim. The algorithm can efficiently provide a resource and enhance its utilization rates.

Liyun zuo, Lei shu, Shoubin dong, Chunsheng zhu [6] presented a different Qos by using Improved Ant colony optimization (IACO) to get the good performance and efficiency. They used to minimize the makespan, cost, resources. They will evaluate by using two different constraints by its feedback condition. Experimental results are based on the muti-objective optimization methods.

Ali Al- maamari and Fatma A. Omara [7] proposed with Dynamic Adaptive Particle Swarm Optimization algorithm (DAPSO) to handle with the different Qos constraints. They used to reduce the makespan and then increase resources utilization. They did a comparison between the MDAPSO and DAPSO algorithm for original PSO algorithm. Stimulation is done with Cloudsim under the comparison of algorithms.

Shengjun Xue, Wenling shi and Xiaolong Xu [9] planned with Service Cost Optimization based on Particle Swarm Optimization for scheduling the task. The quality of services is handled by giving its feedback to proceed with scheduling the task. They handled with the dynamic cloud environment to minimize the makespan and execution cost. A good scheduling is used to provide a better performance compared with existing.

Fatemeh Rastkhadiv and Kamran Zamanifar [10] proposed with Artificial Bee Colony Optimization algorithm will be based on intelligent behavior of bee swarm. They achieved with load balancing through the virtual machine for maximizing the throughput and minimize the makespan. Evaluation is done to increasing the performance by stimulation.

### 3. Research Issues

According to the comparison and related work there are various research issues.

In the following table “Y” stand for this Qos constraints has been taken into consideration

“N” stand for it can be handled in the future work

**Table 1:** Research Issues

Quality of Services	Makespan	Cost	Deadline	Load balancing	Resources Utilization	Reliability	Energy efficiency
Scheduling algorithm							
Artificial Bee colony	Y	Y	N	Y	Y	N	Y
Genetic algorithm	Y	Y	Y	Y	Y	N	N
Ant colony optimization	Y	Y	N	Y	Y	Y	N
Particle Swarm Optimization	Y	Y	Y	N	Y	N	Y

**Table 2:** Comparison on existing optimization algorithm

ALGORITHM NAME	PARAMETERS CONSIDERED	OBJECTIVES	ENVIRONMENT	TOOLS
Improved Genetic Algorithm (IGA) [1]	Execution time, Execution cost	Meta-heuristic based scheduling to minimize the execution time and execution cost.	Cloud Environment	Java Environment
Deadline and Budget distribution-based Cost-Time Optimization [2]	Deadline, Budget	It reduces the cost while meeting its deadlines.	Cloud Environment	Cloudsim
Genetic Algorithm (GA)[3]	Makespan	To minimize the Makespan and utilize the available resources	Cloud Environment	Cloudsim
Deadline constrained Heuristic based Genetic Algorithm(HGAs) [4]	Execution cost	Minimizes the execution cost in cloud resources. The performance is compared to Standard Genetic Algorithm (SGAs).	Cloud Environment	Cloudsim
Load balancing optimization algorithm based on Ant colony algorithm (ACO-LB) [5]	Load balance of virtual machine	It will not only shorten makespan but also maintain the load balance	Cloud Environment	Cloudsim
Improved Ant colony optimization (IACO) [6]	Makespan, execution cost, deadline violation rate, resources	Two constraints functions were used to evaluate and provide feedback regarding the performance and budget cost.	Cloud Environment	Cloudsim
Dynamic Adaptive Particle Swarm Optimization algorithm (DAPSO) [7]	Makespan, execution cost, Resources Utilization	Minimizing the makespan of a particular task set, and in the same time, maximizing resource utilization and good performance.	Cloud Environment	Cloudlet
Bi-Criteria Priority based Particle Swarm Optimization (BPSO) [8]	Deadlines, Budget constraints.	To schedule the workflow application in cloud environments to minimize the execution cost and while meeting the deadline and budget.	Cloud Environment	Cloudsim
Services Cost Optimization based on Particle Swarm Optimization(PSO-SC)[9]	Execution time, Execution cost	To improve the performance and to provide a best optimal solution.	Cloud Environment	Cloudsim
Artificial Bee Colony Optimization (ABC). [10]	Makespan, Load balancing	Reduces makespan and degrees of imbalance. Increases performance and resources efficiently.	Cloud Environment	Cloudsim
Improved Hyper-Heuristic scheduling Approach.[11]	Load balancing, Makespan, Resources utilization.	Enhancing the overall performance of cloud for efficient load scheduling and resources utilization.	Cloud Environment	Cloudlets
MQoS-GAAC Ant colony optimization algorithm (ACO) with Genetic algorithm (GA).[12]	Time-consuming, Expenditure, Security and Reliability	The optimal scheduling Scheme meets user quality of service by using optimization algorithm.	Cloud Environment	Cloudsim
Ant Colony Optimization (ACO)	Makespan	Suitable resources to execute jobs according to the completion times of resources and the size of given job in the grid environment.	Grid Environment	Cloudsim

#### 4. CONCLUSION

In this paper, behind the advantages and disadvantages of various algorithms, the proposed work is on the task scheduling algorithm is based on the optimization techniques in the cloud computing environment can fulfill the goals of civilizing the performance and efficiency of different constraints. A problem of task scheduling and resources utilization application in cloud

environment has been handled. An execution time, execution cost, deadlines and load balancing can be minimized by optimization algorithm for task scheduling. The performance of optimization algorithm in cloud environment is executed and handled with different constraints to obtain their needs. From the results obtained, it is clear that the optimization algorithm finds the optimal result that reduces the execution time, user execution cost, minimum deadlines and load balancing. This proposed algorithm improves the performance and efficiency of the task scheduling, which fulfill the requirements of the

users. In future, we are planning to do with other Quality of services.

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