

# A Survey on Multi Objective Optimization Scheduling in Cloud Computing

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**Abstract**— Cloud computing is developing innovations in IT space. The booking of the cloud administrations to the customers by suppliers impacts the money saving advantage of these registering standards. Assignment booking and procurement of assets are primary issue zones in distributed computing. A powerful undertaking booking technique requires meeting the client needs as well as enhancing the effectiveness of the entire framework. Optimization algorithms are search methods where the goal is to find an optimal solution to a problem, in order to satisfy one or more objective functions, possibly subject to a set of constraints. This paper reviews various task scheduling mechanisms described by various authors.

**Key words:** Cloud Computing, Task Scheduling, Optimization, Virtual Machines, Fault Tolerance, Genetic Algorithm

## I. INTRODUCTION

Multi-objective optimization (also known as multi-objective programming, vector optimization, multi-criteria optimization, multi-attribute optimization or Pareto optimization) is an area of multiple criteria decision making, that is concerned with mathematical optimization problems involving more than one objective function which has to be optimized simultaneously. Multi-objective optimization has been applied in many fields of science, including engineering, economics and logistics where optimal decisions need to be taken in the presence of trade-offs between two or more conflicting objectives. Minimizing cost while maximizing comfort while buying a car, and maximizing performance whilst minimizing fuel consumption and emission of pollutants of a vehicle are examples of multi-objective optimization problems involving two and three objectives, respectively. In practical problems, there can be more than three objectives.

In cloud computing data centres exert server unification to enhance the efficiency of resources. Many VM's (virtual machine) are running on each data centre to utilize the resources efficiently. Most of the time cloud resources are under utilized due to poor scheduling of task (or application) in data centre. Cloud computing provide on demand services to the client.

- Security: The cloud provider will incorporate to maintain the customer's data security, privacy and compliance with necessary regulations.
- Fault Tolerance: Fault tolerance is the ability of the system to react gracefully to an unexpected equipment or programming malfunction. It is used to reduce the wall clock execution time in the presence of *faults*
- Resource Discovery: Cloud processing is a rising field in software engineering. Clients are using less of their own current assets, while expanding utilization of cloud assets. With the development of new

innovations, for example, the cell phones are used more often but not under-used.

- Load Balancing: Load balancing is a recent research topic.
- Cloud computing is a distributed environment which means to share information, figuring, and administration straightforwardly over an adaptable system of hubs. Cloud computing serves on-demand requests of the users with self-managed virtual infrastructure and with efficient resource utilization.
- Task Scheduling: Task scheduling can manage the resource utilization which in turn increases the throughput of the system. Task scheduling is to schedule mechanism of the *tasks* in *cloud*. The planning of the cloud administrations to the purchasers by administration suppliers impacts the money saving advantage of these figuring ideal models. Therefore various task scheduling schemes have been discussed in this paper.

In 2008, A heuristic method to schedule bag-of-tasks (tasks with short execution time and no dependencies) are presented in cloud, so that the number of virtual machines to execute all the tasks within the budget, is minimum and the same time speedup.

In 2009, Marios D. Dikaiakos and George Pallis understood the concept of organisation of Distributed Internet Computing as Public Utility and tended few huge issues and unexploited open doors concerning the organization, effective operations and utilization of distributed computing foundations [1].

In 2009, Dr. Sudha and Dr. Jayarani proposed the proficient Two-level scheduler (client driven meta-scheduler for selection of resources and system centric VM scheduler for dispatching jobs) in cloud computing environment based on Qos.

In 2010, Yujia Ge and Guiyi Wei proposed another scheduler which settles on the planning choice by assessing the whole gathering of undertakings in an occupation line. A hereditary calculation is planned as the advancement strategy for another scheduler who gives better improved traverse and adjusted burden over all hubs than FIFO and delay scheduling.

In 2010, An optimal scheduling policy based on linear programming, in a hybrid cloud scenario is proposed to outsource deadline constraint workloads.

In 2010, An ideal booking approach in view of straight programming, to outsource due date limitation workloads in a crossover cloud situation is proposed [12].

In 2011, Sandeep Tayal proposed a calculation taking into account Fuzzy-GA optimization which assesses the whole group of tasks in a job queue on the basis of execution time and makes scheduling decisions [11].

In 2011, Laiping Zhao, Yizhi Ren and Kouichi Sakurai proposed a DRR (Deadline, Reliability, and Resource-mindful) booking calculation, which plans the assignments such that all the employments can be finished before the due date, guaranteeing the Reliability and minimization of assets [14].

In 2011, S. Sindhu & Saswati Mukherjee proposed two algorithms for cloud computing and compared it with default policy of cloudsims toolkit.

## II. SURVEY OF SCHEDULING SCHEMES

### A. Host Scheduling Algorithm using Genetic Algorithm in Cloud Computing Environment

Tarun Goyal & Aakanksha Agrawal[2013] portray cloud computing as a paradigm in which IT (Information Technology) application provide a service. Distributed computing permits clients to use the calculation, stockpiling, information and administrations from around the globe. In cloud environment, planning is the significant issue. In this paper, a scheduling model based on minimum network delay using suffrage heuristic combined with genetic algorithm for scheduling is considered.

### B. An Efficient Approach for Task Scheduling based on Multi-objective Genetic Algorithm in Cloud Computing Environment [2014]

Sourabh Budhiraj et. al. [7] [2014] explains that cloud computing represents supplement utilization and delivery model for IT benefits based on pay-per-use basis. Its capacity to decrease cost while increasing flexibility and scalability is a great advantage. The booking of the cloud administrations to the customers by administration suppliers impacts the money saving advantage of this processing. In this paper, an efficient approach for task scheduling on multi-objective is proposed which minimizes execution time and execution cost. The exploratory results demonstrate that the proposed calculation can acquire a better performance.

### C. Efficient Qos Based Tasks Scheduling using Multi-Objective Optimization for Cloud Computing

In task scheduling the main issue is that the assignments are received by intermediate broker to specific VM in such a way that it minimize the execution time which eventually increase system throughput. Single target advancement calculation does not give expected result. There are numerous booking calculations like FCFS (First Come First Serve), SJF (Shortest Job First) and Priority Scheduling. FCFS and SJF don't give best result. In priority based scheduling, tasks with higher priority are always executed first and the task with lower priority has to wait for a long time.

#### 1) Multi-Objective Tasks Scheduling Algorithm

- Step 1: Create a list of tasks.
- Step 2: Create a list of VMs.
- Step 3: Perform non-dominated sorting for task list.
- Step 4: Sort the VMs list in the descending order according to MIPS.
- Step 5: The first VM from the VM's list to the first task in the task's list and second VM in the VM's list with second task in the task's list.

Once the allocation reaches the last VM, the next task will be submitted to the first VM of the VM's list and the process of allocation will be repeated for all tasks.

### D. Dynamic Scheduling of Data using Genetic Algorithm in Cloud Computing[2013]

Kaleeswaran et.al. [3] [2013] delineate distributed computing for the usage of pool of assets for remote clients through web that can be effortlessly available and used. To achieve greatest usage of assets the undertakings should be booked. The issue in planning is designating the right assets to the arrived undertakings. The objective of the system is to have maximum utilization of resources and to reduce the execution time. The scheduler instantiates one task per virtual machine. The master node collects information about the nodes that are participating with their memory and processing capacity and transmission rate. The slave node is responsible for implementing the task assigned by the master node.

Data is distributed through these nodes. It considers the work load on each node. Some nodes may always get busy and some nodes may be idle. Parallel handling lessens execution time.

### E. A Study on Strategic Provisioning of Cloud Computing Services[2014]

Md Whaiduzzaman et. al. [5][2014] delineate distributed computing as of now developing a continually changing, worldview that models —everything-as-a-service. Virtualized physical assets, base, and applications are supplied by administration provisioning in the cloud. The advancement in the selection of distributed computing is driven by clear and unmistakable promising components for both cloud clients and cloud suppliers. The expanding quantities of cloud suppliers and the assortment of administration offerings have made it difficult for the clients to pick the best of administrations. So, constant administration provisioning that fulfils the client necessities is a required component for the cloud client and is indispensably essential in distributed computing administration offerings. The author means to audit the cutting edge administration provisioning destinations, vital administrations, topologies, client prerequisites, fundamental measurements, and valuing components. They integrate and condense distinctive procurement systems, methodologies, and models through a far reaching writing audit. A topical scientific classification of cloud administration provisioning is exhibited after the methodical survey. Future examination headings and open exploration issues are distinguished in the end.

### F. Scheduling in Hybrid Clouds

Luiz f. Bittencourt et. al. [4] utilizes idea of schedulers to decide on which handling asset occupations of a work process ought to be assigned. In half and half mists, occupations can be allotted on a private cloud or on an open cloud on a compensation for each utilization premise. The limit of the correspondence channels associating these two sorts of assets effect the make range and the expense of work processes execution. The planning issue is presented in half breed mists introducing the principle attribute to be considered when booking work processes. A brief study of a portion of the booking calculations utilized as a part of these

frameworks is included. To survey the impact of correspondence channels on employment distribution, the effect of the accessible transmission capacity on the execution of a portion of the booking calculation is assessed.

### G. Budget-Driven Scheduling Algorithms for batches of Map Reduce jobs in Heterogeneous Clouds

Yang Wang and Wei Shi considered two functional requirements on spending plans and due date for the booking of a bunch of Map Reduce occupations as a work process on an arrangement of (virtual) machines in the cloud are concentrated. The first concentrates on the booking length advancement under spending plan requirements. In [13] they planned a worldwide ideal calculation by consolidating dynamic programming systems with a neighborhood covetous calculation for spending plan circulation on per-stage premise. The financial backing driven planning of the Map Reduce work processes is generally straightforward, which may not completely mirror some propelled highlights actually, for example, the theoretical assignment booking, excess figuring for adaptation to internal failure and dynamic evaluating.

### H. Energy-Aware Task Scheduling in Heterogeneous Computing Environments

Jing Mei, Kenli Li, Keqin Li [6] proposes that heterogeneous processing (HC) framework is characterized as a suite of circulated registering machines with various capacities which are interconnected by various rapid connections and are used to execute parallel applications. Duplication-based calculations are one of surely understood calculations to take care of planning issues, which accomplish superior on minimizing the general completion time (make span) of uses. The quest for the most brief make span excessively by copying some errands repetitively, which prompts a lot of vitality utilization and asset waste. With the developing promotion for green registering frameworks, vitality protection has been a vital issue and picked up a specific interest. This calculation devours less vitality as well as keeps up great execution as far as makespan contrasted and duplication-based calculations.

## III. CONCLUSIONS

Cloud computing technique is one which can be applied in the real world application. This paper attempts to study and provides a brief knowledge about the multi objective optimized scheduling schemes. Task Scheduling in cloud computing is used to organize jobs according to availability of resources. This survey also gives theory knowledge about various scheduling schemes and also its advantages.

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