# A Survey on Heuristic Based Techniques in Cloud Computing

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**Abstract -** *Cloud computing is an emerging technology. It process huge amount of data so scheduling mechanism works as a vital role in the cloud computing. There are various techniques used in cloud scheduling. In this paper, firstly we explain the concept of cloud computing after that we reviewed cloud scheduling. A heuristic technique often called simply a heuristic, is any approach to problem solving, learning, or discovery that employs a practical method not guaranteed to be optimal or perfect, but sufficient for the immediate goals. There isvarious scheduling based on heuristic technique like Min-Min, Max-Min.*

***Key Words*: Cloud Computing, Cloud scheduling, Min-Min, Max-Min.**

## 1. INTRODUCTION

### 1.1 What is a cloud computing?

Cloud Computing is an emerging technique. Recently it is found that researchers are interested in using cloud for performing scientific applications and even the big organizations are on the verse of switching over to hybrid cloud. Many complex applications require parallel processing to execute the jobs effectively. Due to the communication and synchronization among parallel processes there is a decrease in utilization of CPU resources. It is necessary for a data center to achieve the utilization of nodes while maintaining the level of responsiveness of parallel jobs. The cloud computing is attracting an increased number of applications to run in the remote data centers. Many complex applications require parallel processing capabilities. Some of the parallel applications show a decrease in utilization of CPU resources whenever there is an increase in parallelism if the jobs are not schedule correctly then it reduces the computer performance. Clouds provide a very large number of resources, including platforms for computation, data centers, storages, Networks, firewalls and software in form of services. At the same time it also provides the ways of managing these resources such that users of cloud can access them without facing any kind of performance related problems. Several algorithms & protocols are proposed regarding the scheduling mechanism of the cloud computing. But very few algorithms are proposed to detect the scheduling mechanism in cloud computing. Most of the authors consider a regular monitoring region in their protocol, which is not a real life scenario. Practically the monitoring region is always irregular as the clouds are randomly deployed. So we propose an algorithm to schedule the jobs in cloud computing.

## 2. SENSOR NODE DEPLOYMENT TECHNIQUES

### 1.2 Cloud scheduling:-

There has been little theoretical work on online scheduling on computational grids and clouds (where grid consists of a large number of identical processors that are divided into several machines at possibly multiple locations) In Tchernykh et al. addressed parallel jobs scheduling problem for computational grid systems. They concentrate on two-level hierarchy scheduling: at the first level, a broker allocates computational jobs to parallel computers. At the second level, each computer generates schedules of the parallel jobs assigned to it by its own local scheduler.

**Characteristics:** Cloud computing exhibits the following key characteristics:

**Agility** for organizations may be improved, as cloud computing may increase users' flexibility with re-provisioning, adding, or expanding technological infrastructure resources.

**Cost** reductions are claimed by cloud providers. A public-cloud delivery model converts capital expenditures to operational expenditure. This purportedly lowers barriers to entry, as infrastructure is typically provided by a third party and need not be purchased for one-time or infrequent intensive computing tasks.

**Maintenance** of cloud computing applications is easier, because they do not need to be installed on each user's computer and can be accessed from different places (e.g., different work locations, while travelling, etc.).

**Performance** is monitored by IT experts from the service provider, and consistent and loosely coupled architectures are constructed using web services as the system interface.

**Productivity** may be increased when multiple users can work on the same data simultaneously, rather than waiting for it to be saved and emailed. Time may be saved as information does not need to be re-entered when fields are matched, nor do users need to install application software upgrades to their computer.

**Reliability** improves with the use of multiple redundant sites, which makes well-designed cloud computing suitable for business continuity and disaster recovery.

**Security** can improve due to centralization of data, increased security-focused resources, etc., but concerns can persist about loss of control over certain sensitive data, and the lack of security for stored kernels. Security is often as good as or better than other traditional systems, in part because service providers are able to devote resources to solving security issues that many customers cannot afford to tackle or which they lack the technical skills to address.

### 1.3 Heuristic:

A heuristic technique often called simply a heuristic, is any approach to problem solving, learning, or discovery that employs a practical method not guaranteed to be optimal or perfect, but sufficient for the immediate goals. Where finding an optimal solution is impossible or impractical, heuristic methods can be used to speed up the process of finding a satisfactory solution. Heuristics can be mental shortcuts that ease the cognitive load of making a decision. In computer science, artificial intelligence, and mathematical optimization, a heuristic is a technique designed for solving a problem more quickly when classic methods are too slow, or for finding an approximate solution when classic methods fail to find any exact solution. This is achieved by trading optimality, completeness, accuracy, or precision for speed. In a way, it can be considered a shortcut.A heuristic function, also called simply a heuristic, is a function that ranks alternatives in search algorithms at each branching step based on available information to decide which branch to follow. The objective of a heuristic is to produce a solution in a reasonable time frame that is good enough for solving the problem at hand. This solution may not be the best of all the actual solutions to this problem, or it may simply approximate the exact solution. But it is still valuable because finding it does not require a prohibitively long time. Heuristics may produce results by themselves, or they may be used in conjunction with optimization algorithms to improve their efficiency.

### 1.4 Min-Min:

Minimum completion time for each task in min-min is computed for all machines. The task with overall minimum completion time is chosen and assigned to corresponding machine. The newly mapped task is removed and the process is repeated till all tasks are mapped. Min-min is a simple and fast algorithm capable of good performance. Even GA "seeds" a population with a min-min chromosome to ensure good performance. Min-min schedules "best case" tasks first generating good schedules. Assigning small task first is it drawback. Thus, smaller tasks are executed first and then few larger tasks are executed while many machines are idling, resulting in poor machine use. Min-min establishes minimum completion time for unscheduled jobs, and then assigns jobs with minimum completion time to a processor which offers it. Min-min is developed on MCT
(minimum Completion times).

### 1.5 Max-Min:

Similar to the Min-min, after determining the completion times for each task on all machines, the task with maximum completion time is scheduled on the consistent machine in the case of max-min and the process is repeated until all the tasks are scheduled. In Min-min, the anticipation is that if more tasks are scheduled on machines that execute them earliest and fastest, smaller makespan will be obtained. Max-min is usually employed in a situation where there are fewer longer and shorter tasks. It can as well reduce starvation for the longer tasks since it will enable the longer tasks to be scheduled along with shorter ones

## 2. LITERATURE SURVEY

**N. Patil et al [1]** a very effective and impressive computing environment is provided by cloud computing where the customers or several handlers in need of multiple resources to be provided as a service over the internet. The utilization of sources is to be scheduled efficiently so that it helps in reduced the time for task completion. This is task scheduling which is most essential and important part in cloud computing environment. In task scheduling allocation of certain tasks to particular resources at a particular time instance is done. They have different techniques that are proposed to solve the problems of task scheduling. This paper discusses about the study of various resource scheduling algorithms in a cloud computing environment.

**A. Jain et al [2]** have discussed the evolution of computing from mainframe to cloud computing. Authors have discussed the basic characteristics, type and architecture of cloud computing. Moreover authors have also discussed the different research issues and applications of cloud computing.

**Mubarak Haladu et al [3]** Cloud Computing provides the chance to use computing resources over the internet without owning the infrastructure. The main content of Cloud Computing is to manage Software application, data storage and processing capacity which are assigned to other users on demand through the internet and pay only for what they consume. Task arranged in cloud computing is the biggest overcome because many tasks need to be executed by the available resources in order to meet user's requirements. To achieve best performance, minimize total completion time, minimize response time and maximize resources utilization there is need to allocate these challenges.

**Elzeki et al [4]** a new unique modification of Max-min algorithm is proposed. This algorithm is built based on

study of the impact of RASA algorithm in performing tasks and the atom concept of Max-min strategy. An Improved version of Max-min algorithm is proposed to outperform scheduling map atleast similar to RASA map in total complete time for submitted jobs. Improved one is based on the expected execution time instead of complete time as a selection basis. In turn performing tasks within cloud computing using Improved one demonstrates achieving schedules with comparable lower make span rather than RASA and original Max-min.

**S. Devipriy et al [5]** in this paper varied rule is mentioned then improved the Max-Min programming rule. Min-Min programming rule is employed resource imbalance drawback has occurred. In max-min programming rule most size allotted to minimum completion time. Make span is best than Min-Min rule. Once resource is even then Max-Min rule is employed and resource is odd then Min-Min rule is employed. The result show that RASA rule has higher make span then Max-Min. Improved max-min rule during which largest most task is allotted to the slowest resources.

**A. Jain et al [6]** have proposed a new load balancing approach for cloud computing. Proposed approach has used the concept of biased random walk. Biasing has been achieved through task size, and available capacity of virtual machine. Proposed approach has not only improved the load balancing but also improved the reliability of the system.

**Hsu Mon Kyi [7]** Cloud computing is deployed a large set of virtualized computing resources in different infrastructures and various development platforms. One of the significant issues in cloud computing system is the scheduling of virtual resources and virtual machines. To address this issue, this proposed an efficient approach for virtual machines scheduling in VM management also called Efficient Virtual Machines Scheduling Algorithm that provides the effective and efficient resource allocation.

**Mohd Zamri Murah et al [8]** Cloud computing is a technology that allow the users to access software applications, hardware, storage, computing processes directly from the web. It offers two paradigms in computing; SaaS and PaaS. This paper reviewed the experience of using cloud computing in teaching a graduate level networking course. It had been used to share references, to create collaborative environments, to hold virtual discussions, to manage projects and to deploy web applications. The students were able to learn this latest computing technology without incurring any cost.

**Bhathiya Wickrema Singhe et al [9]** Advances in Cloud computing opens up many new possibilities for Internet applications developers. Previously, a main concern of Internet applications developers was deployment and hosting of applications, because it required acquisition of a server with a fixed capacity able to handle the expected application peak demand and the installation and maintenance of the whole software infrastructure of the platform supporting the application. Furthermore, server was underutilized because peak traffic happens only at specific times.

**Razaque, et al. [10]** an efficient task scheduling algorithm that offer divisible task scheduling in view of network bandwidth and automatically implements the tasks when tasks are scheduled for the execution. Most Efficient Server First (MESF) is a task scheduling scheme that schedules the tasks to maximize the energy aware servers of a data center. MESF decreases average task response time. A Min-min algorithm that takes into consideration both cloud users requirement and resource availability. Proposed algorithm decreases make span of the tasks by analyzed task size.

**Tabak et al. [11]** presented an algorithm enhancement that asymptotically reduced the execution time of Min-min algorithm without affecting the quality of service. Further, the newly anticipated Min-min algorithm is combined with Max-min and Sufferage algorithm, to obtain two hybrid algorithms. The incentive of hybrid algorithms are discourse the disadvantage of Max-min in resolved problematic instances with highly skewed cost circulations and also improved the execution time results of Max-min algorithm.

**Liu et al [12]** developed a new scheduling policy based on work load characteristic, which triggers migration by a multi-threshold method and accomplishes the task of choosing VMs to migrate and migration target. A novel distributed VM migration strategy to solve the above problems. In our strategy, distributed local migration agents autonomously monitor the resource utilization of each PM. Unlike some researched just considering the CPU utilization, our monitoring strategy is more complex by additionally taking the memory utilization and the bandwidth condition into account.

**H. L. Shi [13]** Task scheduling is an important part of cloud computing. According to the needs of QoS and using appropriate means, different tasks are assigned to the appropriate resource nodes, which is an NP hard problem. Currently around scheduling problems in cloud computing environment, they have a lot of researches at home and abroad. Task scheduling problem in cloud computing environment is NP-hard problem, which is difficult to obtain exact optimal solution and is suitable for using intelligent optimization algorithms to approximate the optimal solution.

**H. Wu [14]** Task scheduling in cloud computing means based on the current information of task and resource and in accordance with a certain strategy to build a good mapping relationship between tasks and resources. According to the mapping relationship, the appropriate tasks was allocated to the appropriate resources to performed. The users demands for QoS of tasks are expressed as time, cost, safety and reliability.

**J.-S. Chang [15]** Cloud is a distributed system, which shares thousands of computing resources. The Cloud uses Internet links to connect users to providers. The distribution work load between different nodes within the Cloud network is a crucial step in the process of optimizing the overall workloads. Hence the importance load balancing to allocate efficiently the various available resources including Cloud network links, central processing units, disk drives, or other resources.

**B. Furht et al [16]** Cloud computing can be defined as set services organized on three layers. The Software-as-a Service(SAAS) layer which offer to users the possibility to run applications remotely from the Cloud. The second layer is the Infrastructure-as-a-Service (IAAS) which refers to computing resources as a service. This includes virtualized computers with defined processing power and bandwidth for storage and Internet access. Finally, the Platform-as-a-Service (PAAS) layer which is similar to IAAS, but includes in addition, operating systems and required services to a particular application.

**Mell et al [17]** proposed maximum expected completion time for all the tasks is calculated on all virtual machines. Then completion time for all the tasks is calculated on all the machines. The task with the maximum expected completion time from make span is selected and that tasks assigned to the corresponding resource. We focused on improved Max-Min algorithm instead of basic max-min. The main idea of an improved Max-Min algorithm is that assign task with maximum execution time to resource with minimum complete time at place of original Max-Min assign task with maximum completion time to resource with minimum execution time.

**Etminani et al [18]** In Max-Min algorithm large tasks have highest priority and smaller tasks have lower priority. The make span is calculated in this by the execution of long task .It would be similar to the Min-min make span. On the other hand execute small tasks concurrently on fastest resource to finish large number of tasks during finalizing at least one large task on slower resource. A new Max-Min algorithm that helps in increasing the efficiency of Max-Min algorithm. Improved Max-Min increases the chances of execution of tasks on resources.

**S. Selvarani et al [19]** this paper is to schedule task group in cloud computing environment, where all the resources have different cost and computation performance. Due to task grouping, communication of coarse-grained task/jobs and resources optimizes communication ratio. That reduces the make span and increases the resources utilization. This method has two-phases. In first phase in-Min algorithm is used and in second phase unutilized resources uses the reschedule tasks.

**N. Chopra et al [20]** Cloud computing presents a number of challenges regarding the management of tasks and resources, such as cost constraints and completion time requirements. These challenges are even more prominent for a hybrid cloud computing environment that combines relatively inexpensive but low performance private cloud services with relatively high-cost and high-performance public cloud services. Therefore, it is necessary to determine which tasks are more cost effective in a local private cloud, and which are more cost effective in the public cloud. enterprise management is confronted with both idle resources and increased maintenance costs.

**A. Jain et al [21]** presented a hybrid load balancing approach for cloud environment by combining the best feature of join idle queue, join shortest queue and minimum completion time approach. Moreover, authors have added the prior overloading checking mechanism. Authors have tested the proposed approach on cloud analyst simulator and it has been found that proposed hybrid approach JIMC has outperformed all the basic approach on all the relevant parameter.

**Santhosh B et al [22]** presented this concept a new kind of amendment is to be imposed here known as Max-Min algorithm. In the approved new Max-Min algorithm largest feature is selected and assigned to resource which takes minimum completion time. This time two algorithms are proposed on improved Max-Min where instead of selecting the largest task, a task just greater than Average execution time consumer is selected and assigned to the resource which gives minimum completion time. The experimental results show the new algorithms schedules jobs with lower make span.

**Sandeep Singh Brar et al [23]** this concept we can evaluate this with the up rise of fourth paradigm, that is invention of science over a long interval of time, scientific workflows commence to amend their status amongst in numerous science subject areas indulging physics, astronomy, biology, chemistry, earthquake science and many more. The scheduling algorithms are brushing off the individual dependent and independent tasks. Max-Min algorithm is implemented for scheduling of workflow tasks that is focalized on the consideration of dependent and independent tasks and process independent tasks in parallel that directly gives profit in minimizing computation time**.**

## 3. CONCLUSIONS

The paper survey on make span efficient resources utilize in important issue. Max-Min better in many scenario defects of min and max can be removing using another heuristic technique like suffrage, selective. Deadline is another important issue in cloud computing. Scheduling from over survey concluded heuristic based technique can effectively utilize but can future be improved using other heuristic technique.

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