

# A Brief Review of Various Optimization Techniques for Task Scheduling in Cloud

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**Abstract**— Now a days Cloud computing is most Popular for providing hosting and various services. Due To Cloud Computing Organizations focus on their core businesses instead of spend time and money on computer infrastructure. It Provide Many facilities to their users' like space for storage data, sharing data between different equipment's and pay as used and on demand. Task Scheduling is done by scheduler on cloud many VMs are running parallel so that each user gets resources effectively and no system overloaded with processes or no system sits idle. This paper analyze various Techniques implemented on Cloud Computing to manage tasks and scheduled tasks by applying different algorithms in terms of their make span, their techniques and findings as well.

**Key words:** Self Organizing Map (SOM), Virtual Machine (VM), Software-as-a-Service(SaaS), Enhanced Load Balanced Min-Min Algorithm (ELBMM), Elastic Utility Computing Architecture for Linking Your Programs To Useful Systems (Eucalyptus), Infrastructure-as-Service(IaaS), Platform-as-a-Service(PaaS)

## I. INTRODUCTION

### A. Cloud Computing:

'Cloud Computing' is a blend of technologies where a large no. of systems are connected in private or public networks. This technology provides dynamically scalable infrastructure for data, file storage and application [1]. It provides a digital service delivery over the internet by various applications that are accomplished by computer systems in distributed data centers. Cloud computing is becoming increasingly popular nowadays. Cloud service providers are aimed to provide services using large-scale cloud environment with cost effectiveness [5]. It is the evolution of parallel computing, distributed computing grid computing, and is the combination and evolution of Virtualization, Utility computing, Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS). Cloud is a symbol to define the web as a space where computing has been pre-installed and exist as a service, data, operating systems, applications, storage and processing power lie on the web ready to be shared. To users, cloud computing is a Pay-per-Use-On-Demand mode that can efficiently access shared IT resources through the Internet. Where the IT resources include network, server, storage, application, service and they can be set up with much quick and easy manner and least management and also communication with service providers [13].

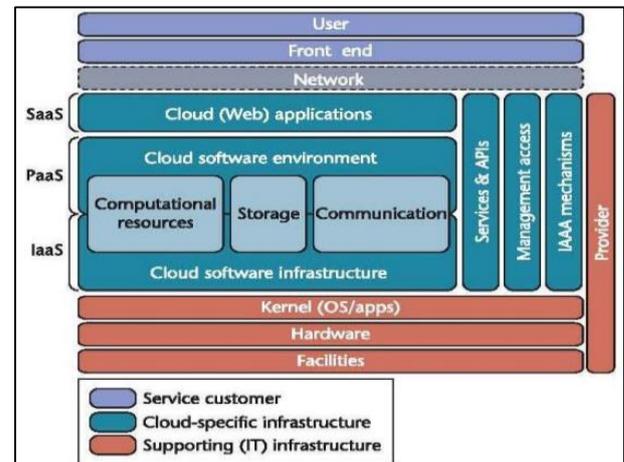


Fig. 1: The cloud reference architecture [13]

### B. Platforms of Cloud Computing:

#### 1) Abi Cloud:

It can be used to build, integrate and manage public as well as a private cloud in the homogeneous environments. Using Abicloud, the user can easily and automatically deploy and manage the server, storage system, network, virtual devices and applications and so on. Using the Abicloud, the user can finish deploying a new service by just dragging a virtual machine with the mouse. This is highly easier and flexible than other cloud computing platforms that deploy new services through command lines.

#### 2) Eucalyptus:

Eucalyptus mainly was used to build open-source private cloud platform. It is an elastic computing structure that can be used to connect the users' Eucalyptus mainly was used programs to the useful systems, it is an open-source infrastructure using clusters or workstation utilization of elastic, utility, cloud computing and a famous computing standard based on a service level protocol that grant users lease network for computing capability. Currently, It is compatible with EC2 from Amazon and may support more other kinds of clients with minimum alteration and extension.

#### 3) Nimbus:

It is an open tool set and also a cloud computing solution providing IaaS. It permits users to lease remote resources and build the required computing environment through the deployment of virtual machines.

### C. Cloud Deployment Models:

There are three different types of cloud deployment models- public, private and hybrid.

#### 1) Public Cloud:

This type of the cloud models are owned by an organization that sell the cloud services. It provides support for the resource allocation dynamically over the Internet using web applications.

### 2) Private Cloud:

This type of the cloud models are available within the company and are managed by the organization. An individual can also create such a cloud and the organization is completely responsible for setting-up, management and maintenance of this cloud.

### 3) Hybrid Cloud;

Such a cloud model provides a mix of services of the public and the private cloud. The services that need more security and are more confidential to the organization are kept private and other services are made public and thus, getting the flavors of both the services according to the requirement. Also, the management of the cloud services is done by the public and private cloud providers for the respective services [15].

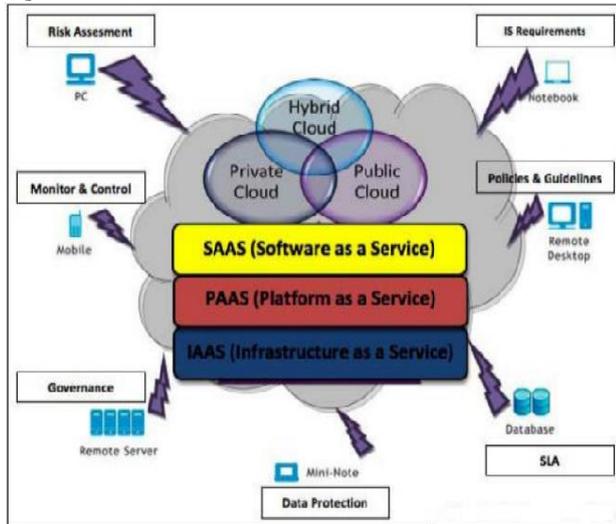


Fig. 2: Cloud Deployment Model[16]

## II. ISSUES & APPLICATIONS OF CLOUD COMPUTING

### A. Issues in Cloud Computing:

#### 1) Privacy:

Cloud computing utilizes the virtual computing technology, users' private data may be scattered in various virtual data centres rather than stay in the same physical location, users may leak hidden information when they are accessed cloud computing services. Attackers can figure out the critical task depend on the computing task submitted by the users.

#### 2) Reliability:

The cloud servers also faces downtimes and slowdowns as our local server.

#### 3) Legal Issues:

Worries stick with safety measures and confidentiality of individual all the way through legislative levels.

#### 4) Compliance:

Numerous regulations relate to the storage and use of data requires regular reporting and audit trails. In addition to the requirements to which customers are subject, the data centers managed by cloud providers may also be subject to compliance requirements.

#### 5) Freedom:

Cloud computing does not allow users to physically possess the storage of the data, leaving the data storage and control in the hands of cloud providers.

### 6) Long-Term Viability:

You should be sure that the data you put into the cloud will never become invalid even your cloud computing provider go broke or get acquired and swallowed up by a larger company.[12]

### B. Applications of Cloud Computing:

There are a few applications of cloud computing as follows:

- 1) Cloud computing provides dependable and secure data storage center.
- 2) Cloud computing can realize data sharing between different types of equipment.
- 3) The cloud provides nearly infinite possibility for users to use the internet.
- 4) Cloud computing does not need high-quality equipment for the user and it is easy to use.
- 5) Computing set up companies and applications, which are system infrastructure dependent, to be infrastructure-less.
- 6) By using the Cloud infrastructure on "pay as used and on demand", all of us can save in capital and operational investment[12].

## III. ADVANTAGES, DISADVANTAGES & FEATURES OF CLOUD COMPUTING

### A. Advantages of Cloud Computing:

Working with data in the cloud can vastly benefit all types of businesses we present bellow the main benefits for businesses in general, focusing at some points on examples for small businesses:

#### 1) Cost efficiency:

Cloud computing is apparently the most cost efficient method to use, maintain and upgrade, as explained in. Traditional desktop software costs companies a lot, in terms of finance. Adding up the certificate fees for multiple users can prove to be very pricey for the establishment concerned. The cloud, on the other hand, is available at much cheaper rates and hence, can significantly decrease the company's IT expenses. Besides, there are many one-time-payment, pay-as-you-go and other scalable options available, which makes it very reasonable for the company in question. Paper adds up that it lowers the cost for smaller firms which intend to apply the compute-intensive techniques.

#### 2) Almost Unlimited Storage:

Storing information in the cloud gives you almost unlimited storage capacity.

#### 3) Backup and Recovery:

Since all the data is stored in the cloud, backing it up and recover the same is relatively much easier than storing the same on a physical device. Moreover, maximum cloud service providers are usually competent enough to handle recovery of information. Hence, this makes the entire process of backup and restoration much simpler than other traditional methods of data storage.

#### 4) Automatic Software Integration:

In the cloud, software integration is generally something that occurs automatically. This means that Cloud users don't need to take supplementary efforts to customize and integrate their applications as per own preferences. This aspect usually takes care of itself.

5) *Easier scale of services:*

It makes it easier for companies to scale their service according to the demand of clients.

6) *Deliver new services:*

It makes feasible new classes of applications and deliveries of new services that are interactive in nature.

*B. Disadvantages of Cloud Computing:*

In spite of its many benefits, as specified above, Cloud computing also has its disadvantages. Businesses, especially smaller ones, need to be aware of these aspects before going in for this technology. The main hazards involved in Cloud Computing are:

1) *Technical Issue:*

Though it is true that information and data on the Cloud can be accessed anytime and from anywhere, there are some points when the system can have some serious malfunction. Businesses should be aware of the fact that this technology is always prone to outages and other technological issues. Even the best Cloud service providers face this kind of trouble, in spite of keeping up high standards of maintenance.

2) *Security in the Cloud:*

The other major issue of Cloud is characterized by security. Before adopting this technology, beneficiaries should know that they will be surrendering all their company's sensitive information to a third-party cloud service provider. This could possibly impose a great risk to the company. Hence, businesses need to make sure that they choose the most reliable service provider, who will keep their information totally secure.

3) *Prone to attack:*

Storing information in the cloud could make the companies vulnerable to external hack attacks and threats, therefore there is always the lurking possibility of stealth of sensitive data.

4) *Possible downtime:*

Cloud computing makes the small business dependent on the reliability of their Internet connection.

5) *Inflexibility:*

Choosing a Cloud computing oftenly means locking the business into using their proprietary applications or structure. For instance, it is not possible to inject a document created in another application into a Google Documents spreadsheet. Furthermore, a company needs to be able to add and/or subtract Cloud computing users as necessary as its business grows or contracts [14].

*C. Cloud Computing Features:*

Following are some important features of cloud computing:

1) *Scalability:*

It can be achieved through server virtualization. The best and most popular example of Cloud computing is Google Apps whose services can be accessed through the browser over the Internet.

2) *Efficiency:*

Cloud computing is cheaper than all other computing models. In cloud, there exists no maintenance cost because the clients are always free from the maintenance and management issues with respect to cloud and its resources. So, other names for cloud computing are IT on-demand and Utility Computing.

3) *Pay-As-You-Grow:*

Consumers are required to pay the service provider only when and for how much they access their services and need not invest a lot of money or develop a complex and costly

infrastructure. Such a model of computing is known as cloud computing. Cloud means a user can access all the services from anywhere and at any time on-demand.

Considering energy efficiency as a factor, a cloud computing data center can be referred to as a large collection of communication and computational resources that are properly managed to convert the energy received into the data transfer or computational work in order to fulfill the requirements specified by the client. [15]

#### IV. LITERATURE SURVEY

The several approaches available for implementing the cloud computing are described as follows:

*A. Overview Of cloud Computing:*

A brief review on the cloud computing is provided by Vijay Kumar in 2016. Cloud Computing is to share resources among the cloud service consumers, cloud partners, and cloud vendors in the cloud value chain. In this paper the author described what is cloud computing, architectural components, popular platforms, applications, issues, challenges, security and privacy issue [12].

*B. Efficient Energy Consumption:*

An approach to implement the cloud computing is provided by Hanen Chihi, Walid Chainbi and Khaled Ghedira in 2012. energy consumption has become a key issue in cloud computing. Cloud computing is an emerging model for distributed utility computing and is being considered as an attractive opportunity for saving energy through central management of computational resources. Obviously, a substantial reduction in energy utilization can be made by powering down servers when they are not in use. A resources provisioning approach based on an unsupervised predictor model in the form of an unsupervised, recurrent neural network based on a SOM [10].

*C. Efficient Management of Cloud Resources:*

An approach to implementing the cloud computing is provided by Seoyoung Kim, Jung-in Koh, Yoonhee Kim and Chongam Kim in 2011. Science cloud becomes a trend in various scientific domains these days. However, it is difficult to provide optimal job execution environment speedily and dynamically depending on user's demands. Therefore, it is very important to predict user's requirements and to prepare execution environment in advance. In this paper, the author proposes a cloud resource provisioning model using statistical analysis of job history. In this model, the author uses job history which is generated from many application executions and identifies attributes of an application by applying statistical analysis. We utilize a statistical technique, PCA (Principal Component Analysis), to inspect execution history of applications and to extract the factors which contribute much to execution time. The powerful factors are used for selecting reference job profile and then VM is deployed on the choosing node based on the reference profile. As a result, this model can provide efficient management of cloud resource for a service provider and reduce management overhead on the cloud [8].

*D. Resolve Unutilized Resource Quota Problem:*

An approach to implementing the cloud computing is provided by Jing-Chen, Yinglong Wang, Bing Xue, Zhigang

Zhao, Ying Guo in 2014. The common allocation method mainly adopts a fixed resource quota to limit a user's for their 1st application. If the user needs more he applies again. The administrator checks his usage and demand and gives him requested quota. In some cases user can occupy the quota without resource utilization for a long time and other users wait for that quota. To address this issue the author propose a credit-based allocation method of resource quota. The main idea is to first set up a user's credit factor according to the user's historical resource quota utilization [3].

*E. Improve Performance Degradation in Parallel Applications:*

An approach to implementing the cloud computing is provided by Song Wu, Zhenjiang Xie, Haibao Chen, Sheng Di, Xinyu Zhao and Hai Jin, T.N.Prabhu in 2016. Tightly-coupled parallel applications in cloud systems may go through from significant performance degradation because of the resource over-commitment problem. The author proposes a dynamic approach based on the adaptive control over time-slice for virtual clusters, in order to reduce the performance degradation for parallel applications in the cloud and avoid the negative impact effectively on other non-parallel applications during the interval. The key idea is to reduce the synchronization overhead inside and across virtual machines (VMs) in cloud systems, by dynamically regulate the time-slices of VMs in terms of the spinlock latency at runtime. Such a design is inspired by our experimental finding that VM's time slice is the main factor determining the synchronization overhead as well as the parallel execution performance [7].

*F. Task Scheduling:*

An approach to implement the cloud computing is provided by LiKun-Lun, Wang Jun, Song Jian and Dong Qing-Yun, Rajinder Tiwari in 2014 and Gaurang Patel, Rutvik Mehta and Upendra Bhoi in 2015 and Dr. Shalu George in 2015. Task Scheduling is one of the major challenges in any system, whether, parallel system, distributed system, cloud computing, where we execute more than one task at a time. Dr. Shalu George propose a new truthful mechanism. Implement the new hybrid PSO-ACO algorithm to achieve two main objectives minimizing cost and time [9]. Propose an improved GEP algorithm with double fitness functions (DF-GEP), and also build up a new ETCC matrix which not only considers the running time of all tasks, but also takes the running cost of the tasks into consideration. [11] Enhanced load Balanced Min-Min algorithm (ELBMM) is based on min-min strategy and task rescheduling to use the unutilized resources effectively. It select the task with maximum completion time and assign it to appropriate resource to produce better makespan and utilize resource effectively [5].

V. OUTLINE OF THE CLOUD COMPUTING IMPLEMENTATION TECHNIQUES

The following table contains all the techniques used to implement Cloud computing that are explained previously and also contains their techniques, the findings and the particular concept on which they are based.

AUTHOR & YEAR	BASED ON	TECHNIQUES	FINDINGS	REF
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				NO
Seoyoung Kim, jung-in Koh, Yoonhee Kim, Chongam Kim in 2011	Statistical Analysis of Job History.	PCA.	Analyze the history, PCA technique is applied to elect the effective factors, utilized for choosing nodes and VM are deployed on the chosen nodes in advance.	8
Hanen Chih, Walid Chainbi, Khaled Ghedira in 2012	Unsupervised neural predictor to auto-administrate the cloud infrastructure	ANN techniques	Increase Server utilization and reduce idle time by applying new paradigms like auto-scaling and autonomic provisioning.	10
JingChen, Yining Wang, Bing Xue, Zhigan Zhao, Ying Guo in 2014	Credit Based Allocation Method of resource	RESOURCE QUOTA	Enhance the fairness in resource quota allocation and satisfy more users demand.	3
LiKun-Lun, Wang Jun, Song Jian and Dong Qing-Yun, Rajinder Tiwari in 2014	Improved GEP Algorithm for Task Scheduling	GEP Algorithm	Improvement in the aspect of the task completion time and operation cost.	9
Gaurang Patel, Rutvik Mehta and Upendra Bhoi in 2015	ELBMM	Min-Min Algorithm	ELBMM produces better makespan and utilize resource as compared to LBMM.	5
Antony Thomas, Krishnalal G and Jagathy	Credit Based Scheduling	Credit Based Scheduling	It works on both cloudlet priority and	1

Raj V P 2015	Algorithm	Algorithm	cloudlet length.its results are effective and makespan is lesser than the task length and task priority scenarios.	
Gamal F. Elhady and Medhat A. Tawfeek in 2015	A Comparative Study into Swarm Intelligence Algorithms for Dynamic Tasks Scheduling	Swarm Intelligence Algorithm	ABC algorithm is superior than the PSO and ACO in terms of better resource utilization, degree of imbalance and better makespan.	2
Dr Salu George in 2015	hybrid PSO-ACO algorithm	TRUTHFUL workflow scheduling	Resolve NP hard problem and achieve global convergence, does rescheduling if task is not completed within the estimate time. Resource utilization is efficient and effective and cost incurred is reliable	4
Song Wu, Zhenjiang Xie, Haibao Chen, Sheng Di, Xinyu Zhao and Hai Jin, T.N.Prabhu in 2016	Adaptive Time-Slice Control	ATC	This approach can achieve 1.5-10× performance gains for tightly-coupled parallel applications compared	7

			to traditional time-slice control schemes like XEN's Credit scheduler and the scheduling approaches like Co-scheduling and Balance Scheduling	
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Table 1: Various Techniques Used In Cloud Computing to Improve Performance

## VI. CONCLUSION

The cloud provides many services to organizations and computer users. In this study, we have analyzed many techniques implementing on the cloud to manage task scheduling effectively with lower cost.

Credit Based Scheduling Algorithm lesser the makespan of the task as compared to min-min and cost based scheduling algorithm. A Comparative Study of ABC, PSO, and ACO proves that ABC algorithm is superior in resource utilization than the other two. For getting fairness to serve tasks to cloud a credit based Allocation Method of Resource Quota is used. It can enhance the fairness to serving tasks and satisfy more users demand. Hybrid PSO-ACO algorithm resolve NP-hard problems and rescheduling tasks if the task is not completed within estimated time. Train a scheduler by using computational Intelligence, by this approach find the best strategy for scheduling. ELBMM produces better makespan than LBMM. ATC approach can achieve 1.5-10× performance gains for tightly-coupled parallel applications. Unsupervised neural predictor to auto-administrate the cloud infrastructure proposes a model for energy saving in the cloud by increasing server utilization and decrease idle time.

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