A Survey on Various Scheduling Algorithms in Cloud Environment

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Abstract—Cloud computing involves group of remote servers and software networks that allows online access to computer services or resources and centralized data storage. It enables the users and the consumers to use various applications provided by the cloud provider. The scheduling algorithm is employed for the purpose of mapping the requests of users to the appropriate resources available. One of the most challenging problems in Cloud computing is the scheduling the problem of minimizing the cost of task executions. In this paper, different types of scheduling algorithms have been surveyed and comparison based on various parameters has been made.

Key words: Cloud computing, multiple Cloud environment, scheduling algorithm, PSO (Particle Swarm Optimization), GA (Genetic Algorithm), Mobile cloud.

I. INTRODUCTION

According to R.Buyya and S.Venugopal [3] “Cloud Computing is a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreement established through negotiation between the service provider and the consumer”. With the promotion of the world’s leading companies, cloud computing is attracting more and more attention for providing a flexible, on demand computing infrastructure for a number of applications [2].

A. Types of cloud:

There are different types of clouds which are explained below:

1) Private cloud:

For a single business private cloud are made. Data security was the main aim of private cloud. This cloud provides greater control, which is typically absence in a public cloud. Private cloud are hosted by either internally or externally.

2) Public cloud:

A third party operates public cloud. Same infrastructures are shared by customers. The model provides services at low cost for the customer. Cloud provider managed all the things such as security protections etc. Public cloud is larger than private cloud.

3) Multi-cloud:

Multi-cloud is the use of multiple cloud computing services in a single heterogeneous architecture.

B. Need for multi-cloud environment

Multi-cloud consists of two or more cloud web services. If any cloud services provider gets damaged then another service provider provides services. This approach deals with the requests that are coming from several users by way of finding the suitable resource for request processing. Some clouds are better provide services than others. It is used to reduce the problem of local devices crash.

As shown in Fig.1 [13], a group of agents (CSPs) are present in the bottom layer. Above that layer, a CIS is designed. CIS stores the private data regarding resources. CIS is used by the cloud coordinator to compare the private data regarding user tasks and to choose which CSP is suitable for the job execution. In brokerage layer, the proposed pricing scheme and the scheduling algorithm have to be implemented by choosing the appropriate resources with least execution time and cost for the user tasks. The top layer is connected to both the brokerage layer and the bottom layer. The users can submit their tasks either to the brokerage layer or directly to the CSPs. Scheduling mechanism takes place at brokerage layer. Tasks scheduling is done by the cloud broker.

Fig. 1: Multiple cloud service providers services [13]

II. EXISTING SCHEDULING ALGORITHMS

The following workflow scheduling algorithms are currently usual in clouds and these algorithms have been discussed in Table1.

Suraj Pandey, Linlin Wu, Siddeswara Mayura Guru, Rajkumar Buyya worked on scheduling applications. They proposed a particle swarm optimization (PSO) based heuristic where cloud resources applications are scheduled. The heuristic proposed is generic. The results show that PSO can achieve approximately 3 times cost savings as compared to BRS (Best Resource Selection) and good distribution of workload on to resources.

EComer had been designed by Jian Li, Sen Su, Xiang Cheng, Qingjia Huang, Zhongbao Zhang for the use of cloud resources for dispatching tasks of large graph processing. EComer can be integrated into cloud infrastructure which was exiting. The key component of EComer is a cost-conscious scheduling heuristic. Firstly a priority list of tasks is generated and then the task with the highest priority is assigned to the virtual machine which was cost-efficient in a cloud.

Nuttapong Netjinda, Booncharoen Sirinaovakul, Tiranee Achalakul applied PSO method in cloud environment to optimize cost. The paper designed new...
framework which considered a large number of purchased instance, instance type, purchased options, and scheduling of tasks within an optimization process. PSO technique is used to identify a solution in efficient time. The paper also designed decoding scheme to convert real values in PSO’s particles into an integer which represents solution.

Resources Scheduling Based on ACO Algorithm and PSO Algorithm, presented by Xiaotang Wen, Minghe Huang, Jianhua Shi, overcomes the problem of previous algorithms which easily fall into local optima. The algorithm reaches at global optimal solution. The algorithm cannot stop at local optimal solution. The authors have compared ACO algorithm and ACO-PSO and find that time and cost are reduced in case of ACO-PSO algorithm.

AV.Karthick, Dr.E.Ramaraj, R.Ganapathy Subramanian worked on multi-queue job scheduling in cloud environment. The proposed algorithm reduces the reservation cost. This method reduced the starvation problem. The jobs are selected dynamically for the achievement of optimum cloud scheduling problem. MQS utilizes the free unused space of resources for increased performance.

AV.Karthick, Dr.E.Ramaraj, R.Kannan used tri queue for job scheduling. The algorithm proposed an Efficient Tri Queue Job Scheduling using Dynamic Quantum Time for Cloud Environment. The algorithm grouped different types of jobs in the queue which were based on the processor needed and time to allocate the resources to the computers. Fragmentation problem was removed by TQS algorithm.

Yacine Kessaci, Nouredine Melab and El-Ghazali Talbi proposed a new multi-objective Genetic Algorithm (MOGA-CB). This algorithm can be integrated in a cloud broker. In the optimization process two objectives were considered, first is minimizing both the response time & the cost of the VM instances which are selected and second is to maximize the profit of the broker.

Based on PSO, Gang Zhao proposed a modified algorithm to solve the task scheduling problem in cloud computing environment. The algorithm added a cost-aware fitness function to quantify the cost of resource usage. This method achieved the goal of minimizing both the processing time and resource usage and also has found global optimal solution. The simulation result indicated that the proposed algorithm outperforms the traditional PSO algorithm.

In Improved Binary PSO-based Task Scheduling Algorithm, Xu, Kun Wang, Zhiyou Ouyang, Xin Qi proposed a green cloud task-scheduling algorithm (GCTA) based on the improved binary particle swarm optimization. GCTA made a matrix of pipeline number and simplify. Matrix also redefines the particle position and velocity. The problems of BPSO to solve cloud task scheduling are solved by GCTA. The simulation of GCTA shows less execution time and reduced resource consumption.

Multiobjective real time task scheduling algorithm proposed by M. Geethanjali, J. Angela Jennifa Sujana, T. Revathi, made a scheduling mechanism for real time tasks to meet timing constraint and achieve minimum cost for the job execution. The results of the proposed algorithm are effective and the simulation results outperform the traditional scheduling algorithms with multi-objective optimization. The algorithm is compared with SPEA2 and NSGA-II. The experimental results proved that the proposed mechanism has produced much smaller execution times as compared to existing MOEAs.

WenAn Tan, Yong Sun, Ling Xia Li, GuangZhen Lu, and Tong Wang proposed a scheduling algorithm which considered trust service-oriented workflow. The algorithm considered both direct trust and recommendation trust. The key idea is to find the optimum solution by adjusting the weights of time and cost. The result showed by the algorithm is effective and feasible.

By using 2D chromosome, Zhiming Cai, Chongcheng Chen, proposed demand-driven task scheduling model and introduced an estimate method to predict warranty complete time of tasks in wireless network. Two objectives which are taken by them are smaller makespan and load balancing. Testing of 2DCGA shows good performance.
### III. CONCLUSION

This paper has surveyed various existing workflow scheduling algorithms in cloud computing and those have been presented in tabulated form by comparing them on various parameters. It has been concluded that there is a need to improve existing scheduling algorithm so as to minimize execution time and cost in multi-cloud environment. In future, evolutionary PSO technique could be used to overcome existing problems associated with multi-cloud scheduling.

### REFERENCES


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