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A Review of Cloud Computing Scheduling Strategies

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ABSTRACT
Cloud Computing is the nascent technology which is based on pay-per-use model. It is computing paradigm where applications, data, bandwidth and IT services are provided over the Internet. Goal of the cloud service providers to use resource efficiently and attain the maximum profit. So, this leads to task scheduling as a core and challenging issue in cloud computing. Scheduling is the process of deciding how to commit resources between a varieties of possible tasks. In this research paper various types of scheduling algorithms that provide efficient cloud services have been surveyed and analyzed. Based on the study of different algorithms, a comparison between them is presented on the basis of different parameters.
Keywords:- Cloud Computing, Genetic Algorithms, Task Scheduling.

I. INTRODUCTION

Cloud computing is the delivery of computing services over the Internet. Cloud services allow individuals and businesses to use software and hardware that are managed by third parties at remote locations. Examples of cloud services include online file storage, social networking sites, webmail, and online business applications. The cloud computing model allows access to information and computer resources from anywhere that a network connection is available. Cloud computing provides a shared pool of resources, including data storage space, networks, computer processing power, and specialized corporate and user applications. Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. The characteristics of cloud computing include on demand self-service, broad network access, resource pooling, rapid elasticity and measured service. On demand self-service means that customers (usually organizations) can request and manage their own Computing resources. Broad network access allows services to be offered over the Internet or private networks. Pooled resources means that customers draw from a pool of computing resources, usually in remote data centers. Services can be scaled larger or smaller; and use of a service is measured and customers are billed accordingly. The cloud computing service models are Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). In a Software as a Service model, a pre-made application, along with any required software, operating system, hardware, and network are provided. In PaaS, an operating system, hardware, and network are provided, and the customer installs or develops its own software and applications. The IaaS model provides just the hardware and network; the customer installs or develops its own operating systems, software and applications.

A number of algorithms presented in scheduling as follows:

II. SCHEDULING ALGORITHMS IN CLOUD COMPUTING

1. Independent Task Scheduling in Cloud Computing by Improved Genetic Algorithm [10]

In the normal Genetic Algorithm the initial population is generated randomly so the different schedules are not so much fit, so when these schedules are further mutated with each other, there are very much less chances that they will produce better child than themselves. In an improved genetic algorithm, the idea for generating initial population by using the Min-Min and Max-Min techniques for Genetic Algorithms. By using this technique multiple jobs can be scheduled on multiple machines in an efficient manner by taking minimum time for completion. This improved genetic algorithm is adopted in the cloud computing systems for efficient scheduling of tasks with optimum utilization of resources, so that the user's tasks can be completed in as minimum time as possible.

Parameters : VMs and Cloudlets

Tools : Cloudsim

2. The Study of Genetic Algorithm-Based Task Scheduling for Cloud Computing [11]

In the proposed Model, the task scheduler calls the Genetic Algorithm scheduling function for every task scheduling cycle. This function creates a set of task schedules and evaluates the quality of each task schedule with user satisfaction and virtual machine availability. The function iterates genetic operations to make an optimal task schedule. The Restart operation is also applied to the Genetic Algorithm scheduling function for the improvement in quality of task scheduler. The iterated task scheduling model is simulated with the diverse experiments like Coding and Initiation, Fitness Function and Selection, Crossover and Mutation, Restart and Stop Condition etc. for Performance Evaluation. Empirical results prove that the proposed task scheduling model outperforms existing task scheduling models, which are the round-robin task scheduling model, the load index-based task scheduling model, and the activity based costing based task scheduling model.

Parameters : Throughput, Simulation Time, Average VM Utilization, Average Response Time, Average Processing Cost and No. of Tasks.

Tools : GA-Based Task Scheduling Model.

3. Dynamic Scheduling of data using Genetic Algorithm in Cloud Computing [12]

In Dynamic Scheduling task arrival is uncertain at run time and allocating resources are tedious as all task arrive at the same time. To avoid this genetic algorithm is used. Genetic algorithm is a heuristic method that deals with the natural selection of solution from all possible solution. Using genetic algorithm the tasks are scheduled according to the computation and memory usage. This way tasks are scheduled dynamically. The execution time is also reduced by parallel processing. Using genetic algorithm in cloud computing it scale up the application by maximizing the concurrency and by using resource efficiently. By improving the Time and Resource utilization results in high signification. Optimization also concentrate on their factors like shared resources, statelessness, partitioning the database and resource utilization.

Parameters : Time Utilization and Resource Utilization.

Tools : Ubuntu Enterprise Cloud.

4. Task Scheduling Optimization for the Cloud Computing Systems [13]

In this paper authors present a new high-performance scheduling algorithm, called the longest dynamic critical path (LDCP) algorithm, for HeDCSs with a bounded number of processors. The LDCP algorithm is a list-based task Scheduling algorithm that uses a new attribute to efficiently select tasks for scheduling in HeDCSs. The efficient selection of tasks enables the LDCP algorithm to generate high-quality task schedules in a heterogeneous computing environment.

The performance of the LDCP algorithm is compared to two of the best existing scheduling algorithms for HeDCSs: the HEFT and DLS algorithms. The comparison study shows that the LDCP algorithm outperforms the HEFT and DLS algorithms in terms of schedule length and speedup. Moreover, the improvement in performance obtained by the LDCP algorithm over the HEFT and DLS algorithms increases as the inter-task communication cost increases. Therefore, the LDCP algorithm provides a practical solution for scheduling parallel applications with high communication costs in HeDCSs.

Parameters : Flexibility, Virtualization.

Tools : Not Implemented

5. *Impatient Task Mapping in Elastic Cloud using Genetic Algorithm [14]*

The Algorithm proposes that can find a fast mapping using genetic algorithms with "Exist if Satisfy" condition to speed up the mapping process and ensure the respecting of all task deadlines. This proposes two approaches one of Random guided search represented by Genetic Algorithm and other is Enumerative search represented by Minimum completion time only if the Genetic algorithm stop condition is controlled on "Exist if Satisfy". These show the trade-off between the makespan and waiting time.

Parameters : Number of Jobs, Time.

Tools : CloudSim

6. A Genetic Algorithm for Workload Scheduling in Cloud Based e-Learning [15]

This work presents the characteristics of a private cloud used for eLearning purposes along with a genetic algorithm that optimizes the scheduling of the e-Learning workloads according to a set of conditions that are imposed by the underlying virtualization technology such as memory over-commitment and IOPS rate distribution. They have described the operational model of a private cloud designed for e-Learning activities and a scheduling mechanism for this e-Learning scenario based on a genetic algorithm. This algorithm is able to find a near optimal solution for the scheduling problem considering the existence of conflicting requirements. The experiments that have been carried show that the genetic algorithm is a efficient solution for enabling co-existence of Planned Scheduling Requests and One-Off Scheduling Requests, by enabling a high and uniform utilization of the cloud resources. Also, the solutions generated by the genetic algorithm are enabling an optimum co-scheduling of workloads based on the workload profile.

Parameters : Load distribution for Window, CPU intensive, IO intensive.

Tool : IBM Cloudburst System

III. A number of researchers have worked on various parameters in the field of cloud computing as follows:

Paper	Execution Time	Response Time	Trust	Makespan	Utilization	Flowtime	Cost	Successful Execution	Reliability	Fairness	Load Balancing	Reasonable Complexity
An ACO-inspired algorithm for minimizing weighted flowtime in cloud-based parameter sweep experiments[4]				√		√						
Job Scheduling algorithm based on Berger model in Cloud environment[5]	√									√		
Cloud-DLS: Dynamic trusted scheduling for Cloud Computing[6]	√		√					√	√			
An Improved Min-Min Algorithm in Cloud Computing[7]	√				√							
A Particle Swarm Optimization(PSO)- based Heuristic for Scheduling Workflow Applications in Cloud Computing Environment[8]							√				√	
A Priority based Job Scheduling Algorithm in Cloud Computing[10]				√								√
Analysis of variant in Round Robin Algorithms for Load Balancing in Cloud Computing[11]		√									√	
Load Balancing in Cloud Computing using Stochastic Hill Climbing-A Soft Computing		√									√	

Approach[12]												

Table 1: Comparison of scheduling algorithms based on various parameters

IV. CONCLUSION

In cloud computing environment number of different resources are provided as a service in the form of virtual machines and these machines are allocated and the allocation is scheduled by scheduling algorithm. Scheduling is the key issue in the management of application execution in cloud environment.

In this paper, few existing scheduling algorithms are studied. The literature of various authors and researchers has been compared and the different parameters as well as tools they used are discussed. Mostly they all work on to minimize the execution time, faster response time and maximum utilization of resources. Existing scheduling algorithms does not consider the load balancing, availability and reliability. Therefore, there is a need to implement such scheduling algorithm that can improve the reliability, availability and load balancing in cloud computing environment. In future, algorithm based on migration of task from one machine to another can also be introduced.

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