A Survey on Task Scheduling Techniques in Cloud Computing

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ABSTRACT

In today's scenario cloud computing is the most advanced technology due to its elasticity of resource provisioning and the pay-as-you-go model which enables customers to pay only according to their need. As cloud can be accessed anytime and anywhere only via commodity hardware reason its demand is increasing day by day. So it must provide high performance gain to the customer and on the similar front time should be beneficial for the Cloud Service Provider (CSP).To achieve this goal many challenges have to be faced. Task Scheduling is one of them which helps the CSP to meet the QoS requirements of the users and at the same time it increases its profit by optimum usage of the resources. To optimize the task in cloud the workload and shared resources must be scheduled in an efficient manner. A survey of various task scheduling algorithms with their pros and corns. We have also justified some of their shortcomings for further development.

I INTRODUCTION

Cloud Computing

Everyone has his/her own conviction regarding the concept of cloud computing. Cloud computing is a model used for convenient , on-demand network access meant for a shared pool of the various configurable computing resources (e.g. servers storage, network, services and applications) that can be rapidly provisioned and disowned with minimum effort and service provider interaction.

Cloud Scheduling

Traditional cloud scheduling algorithms typically aim to minimize and decrease the time and cost for processing all tasks scheduled. However, in cloud computing environment, computing capability varies from different resources and the cost of the resource usage. Therefore, it is important to take into consideration the cost. A scheduling algorithm is used to schedule the task with maximum estimated gain or profit and execute the task in the queue.

Need for Cloud Scheduling

In cloud computing, users may utilize hundreds of thousands of virtualized resources and it is impossible for everyone to allocate each task manually. Due to commercialization and virtualization, cloud computing left the task scheduling complexity to virtual machine layer by utilizing resources virtually. Hence to assign the resources to each task efficiently and effectively, scheduling plays an important role in cloud computing.

II TYPES OF CLOUD SCHEDULING

The different types of cloud scheduling are:

User level scheduling: User level scheduling comprises of market based and auction based scheduling. FIFO scheduling, priority based, non preemptive scheduling etc. are used in user level scheduling.

Cloud Service Scheduling: Cloud service scheduling is classified at user level and system level. At user level, it mainly considers the service regarding problems between the provider and the user. At system level, scheduling and resource management is done. In addition to real time satisfaction, fault tolerance, reliability, resource sharing and QoS parameters are also taken under consideration.

Static and Dynamic Scheduling: Static scheduling permits pre-fetching of required data and pipelining of distant stages of task execution. Static scheduling imposes minimum runtime overhead. In case of dynamic scheduling, information of the job components or task is not known before. Thus the execution time of the task may not be known and the allocation of tasks is done only as the application executes.

Heuristics Scheduling: In cloud environment, heuristic based scheduling can be done to optimize results. More accurate results can be built by heuristic methods.

Workflow Scheduling: For the management of workflow execution, workflow scheduling is done.
Real Time Scheduling: Real Time Scheduling in cloud environment is done to increase the throughput and to decrease the average response time instead of meeting deadline.

Performance Parameters of Cloud Scheduling

Various cloud scheduling parameters are discussed below :

Makespan: (completion time of a schedule): The time variation between the start and finish of a sequence of schedule.

Resource Cost: Resource cost in a cloud can be determined by resource capacity and occupied time. Powerful resources led to higher cost.

Scalability: Capability to cope and perform with increased workload and has ability to add resources effectively.

Reliability: The ability of a system to continue work even in case of failure.

Resource Utilization: This parameter defines how effectively the system utilizes the resources

III BRIEF LITERATURE SURVEY

D.I. George Amalarethinam et al. [1] proposed that on-demand service and pay-per-use schemes provided by the Cloud providers attracts the customers to move towards Cloud computing environment. Now the service providers and the customers will economically receive the benefits only when the resources that are available are correctly scheduled. Due to commercialization, the cloud computing environment emphasizes on the need for the development of new improved algorithms for better economic factors.In this paper, an algorithm Customer Facilitated Cost-based Scheduling (CFCSC) algorithm proposed to favour the Cloud customers with economic cost.

Antony Thomas et al. [2] proposed the need for a number of resources arose. But cloud providers have limited resources and are compelled to strive to the maximum utilization. Min-Min algorithm is used to reduce the make span of scheduled tasks by considering the task length. Cloud providers should achieve customer satisfaction. Thus the research favors scheduling algorithms that consider both customer satisfaction and also resources availability. In this paper an improved task scheduling algorithm is introduced that is based on client priority and the task length. High prioritized tasks are not given importance as they arrive.Thus the experimental result shows a considerable improvement in the utilization of resources.

Mala Kalra et al. [3] proposed one of the major research issues which need to be considered for its efficient performance is scheduling. The main aim of scheduling is to map the tasks to optimize one or more objectives. Scheduling in cloud computing belongs to problem known as NP-hard problem due to large solution space and it takes a long time to find an optimal solution. No algorithms produce optimal solution. In this research paper an extensive survey and comparative analysis of different scheduling algorithms for cloud and grid environments based on three popular meta heuristic techniques: ACO, GA and PSO and two novel techniques: LCA and BAT algorithm.

Atul Vikas Lakra et al. [4] proposed In cloud computing data centers exert server unification to enhance the efficiency of the resources. Many VMS are running on each data center to utilize the resources efficiently. Mostly the cloud resources are underutilized due to poor scheduling of task in the data center. Here we define how a multi-objective task scheduling algorithm that maps to the tasks to a VMS in order to improve the throughput of the data center and reduce the cost.

Nidhi Bansal et al. [5] proposed that many parameters considered in QoS driven like the makespan, latency and load balancing. Minimizing the total allocation of cost is an important issue in cloud computing. The cost is calculated of QoS-driven algorithm and compare with traditional scheduling algorithm in cloud computing. The experimental results is based on cloudsim3.0 toolkit installed with Net Beans that achieves a good performance in the cost parameter.

Alexander Visheratin et al. [6] proposed an efficient task scheduling is the important part of complex scientific applications that processes in computational distributed environments. The complexity of the environment heterogeneity as the application structure is represented as a workflow which comprise of different linked tasks. The most popular of them was based on greedy list-based heuristics. Here we investigate the applicability of earlier developed meta heuristic algorithm for scheduling series of the workflows with hard deadlines constraints.

Brototi Mondal et al. [7] proposed a new concept of virtualized computer resources. Cloud computing describes a platform and type of application. Servers in the cloud can be virtual machines spanned across the network. Selecting nodes for executing a task must be considered to

exploit the effectiveness of the resources. A local optimization Stochastic Hill climbing is used for the allocation of the incoming jobs to the servers or virtual machines.As CloudAnalyst is a CloudSim-based Visual Model for analyzing cloud computing environments and applications. A survey is also made with Round Robin and FCFS algorithms.

Huan Ma et al. [8] proposed the use of cloud resource sharing based on the analysis of cloud computing environments difficulties on digital forensic, new digital forensic methods and the new digital forensic architecture in the cloud-based platform is the purpose to meet the rapid forensics needs in the new era of cloud computing and to deal with the effectiveness, depth issues and real-time and reliability problems.

N. Ch. S. N. Iyengar et al. [9] proposed a technology which completely transfers the data to the unaware datacenter where its the responsibility of cloud service provider for the data subscribers' and its protection. Distributed Denial of Service is a kind of the threat that aims to subvert DC and their resources which leads to the resource unavailable to legitimate. An effective layered load balancing mechanism that scrutinizes the incoming request traffic at various layers and every layer outwits some kind of attack traffic. The simulation proved the mechanism proposed deployable at an attack-prone DC for the resource protection, which would eventually benefit the DC economically.

Kook-Hyun Choi et al. [10] proposed cloud computing as a great deal requirement of service resources as hardware capacity it is an important factor that should be calculated in a systematic manner and accurately. For this reason, the research on hardware capacity calculation technique for SaaS, the foundation of cloud services, is the key research that is needed to expand into a variety of projects within the cloud in the future. In this research, the method and the criteria for capacity calculation of the SaaS-based hardware is presented. It is possible to utilize the result of this research as a guideline for calculating the hardware capacity when establishing a cloud computing environment.

Kushang Parikh et al. [11] proposed that Cloud computing is a very important concept that can be used to enrich the next generation data centre and develop the application based on user requirement. CloudSim is an extensible simulation toolkit that validates modelling and simulation of cloud computing. The model for dynamic load balancing policy with considering different attributes and service level agreements in the cloud computing environment that helps this environment to utilize their resources and also improve the performance. The proposed model uses a Hungarian algorithm and the result is verified.

Ying Gao et al. [12] proposed to solve the resource scheduling problem in cloud via IaaS platform, a scheduling model based on the ant colony algorithm was put forward. In this algorithm, pheromone changes dynamically according to the best suitable route searched by ants. The model automatically updates pheromones and instructs ants to search the global best possible route. The experiment result proves that the model proposed is of better ability in the energy consumption in IaaS cloud computing platform.

Mini Singh Ahuja et al. [13] proposed that complex networks are those networks whose structure is very irregular, complex and evolving dynamically. Its main focus will be the analysis of small networks to that particular of a system with thousands or millions of node. It has been found from the review that there is a better way for cloud computing. Therefore, this paper winds up with the future scope to solve these issues.

Hao Yuan et al. [14] proposed that virtual resource scheduling is very important topic in the field of cloud computing. Based upon a particle swarm scheduling algorithm, the paper introduces cellular automata theory to construct a new cellular particle swarm algorithm. This approach by mathematical modelling for virtual resource scheduling of the cloud computing and complete the final search configuration based on a directional optimization objective function. Experimental result shows that the proposed method has been more excellent scheduling performance, in the case of changes in resources, can be also kept as stable scheduling balance.

Ryan P Taylor et al. [15] proposed the ATLAS experiment at the LHC has being included in cloud computing technology and cloud resources into its primary grid-based model of the distributed computing. Cloud R&D activities continues to mature and transition into a stable production system, while ongoing evolutionary changes are still needed to adapt and the techniques used, in response to the changes in prevailing cloud technology. Completely new developments are needed to handle the emerging requirements. This paper highlights the overall evolution of cloud computing in ATLAS. The active status of the virtual machine management system used for harnessing Infrastructure as a Service resource. The use of high level trigger experiment of farm for the Monte Carlo production, in a very specialized cloud environment, is presented. Finally, we evaluated and compared the performance of commercial clouds using distinct benchmarks.

L. Sreenivasulu Reddy et al. [16] proposed scheduling algorithms that focus on the application of analytical methods to facilitate better decision making. The paper aim to raise the awareness of diagnostic specialists with regards to the practical scheduling algorithm applications. The scheduling algorithm applications are used as a part of mainstream decision making by the diagnostic center specialists. Common people in the real world face so many problems those are solvable and every day in the diagnostic centers for a malaria parasite check-up.

Mohsin Nazir et al. [17] proposed that cloud computing is a group of IT services that has been presented by a person on the network with current ability to scale up and down their service requirements. Cloud Computing services delivered by a way of third party provider the master of the infrastructure. Cloud computing involves deploying sets of a remote servers and software networks that allows a centralized data storage and internet based having access to the computer services or resources.

Qing Xie, Di Zhu et al. [18] proposed that Hybrid electrical energy storage systems are comprised of a multiple banks of heterogeneous EES elements with distinct properties. The paper defines and solves the problem of the scheduling multi charge migration tasks in Hybrid electrical systems with the objective of minimizing the total energy drawn from the source banks. The solution has two steps: (a).It finds out the best charging profile and voltage setting level for the Charge Transfer Interconnect bus for each and every charge migration task, and (b) Merging and scheduling the charge of the migration of tasks. Experimental result demonstrates the improvements of up to 32.2% in the charge of migration efficiency compared to baseline setup in an example HEES system.

Yogesh Sharma et al. [19] proposed that popularity of cloud becomes important to provide an on-demand service dynamically according to the user's requirement. Reliability and energy efficiency are the two big challenges in cloud computing systems that requires a careful attention and investigation. This paper first proves a review of the existing techniques for the reliability and energy efficiency and then it identifies the research gaps to combine these two metrics for resource provisioning in cloud.

Anu et al. [20] proposed fault tolerance means a resource that keeps on functioning the irrelevant faults occurring in it. Revolution in the computer science can be easily seen with the development of the emerging trend of computing such as cloud computing. Prominence of this technology can be validated very easily with its phenomenal feature as pay-per-use, scalability and on demand availability of the computing resources. By implementing appropriate Fault tolerance technique in cloud mentioned in above problems can be resolved. Types of faults in the cloud computing and techniques are available for handling them are discussed in this paper. Some of the information that is relevant to proactive fault tolerance by a fault monitoring based on Nagios is also discussed here.

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