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A STUDY ON JOB SCHEDULING IN CLOUD ENVIRONMENT

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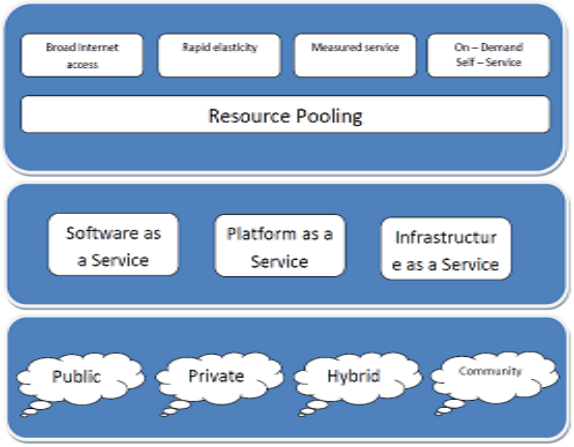
ABSTRACT

Cloud computing provides reliable, customized and dynamic services using very large scalable and virtualized resources over the Internet. Due to novelty of cloud computing field, there is no standard task scheduling algorithm used in cloud environment. Especially that in cloud, there is a high communication cost that prevents well known task schedulers to be applied in large scale distributed environment. Some intensive researches have been done in the area of job scheduling of cloud computing. The scheduling algorithms should order the jobs in a way where balance between improving the performance and quality of service and at the same time maintaining the efficiency and fairness among the jobs. This paper aims at studying various scheduling algorithms recently proposed in cloud computing.

Index terms: Cloud Computing, Job Scheduling, Scheduling Algorithm.

I INTRODUCTION

Cloud computing is Distributed Computing paradigm which provides services to the customers. Cloud Providers provides services to their customers and charges as per usage by particular customer. That is, use as much or less you want to use, use services when you want to use and pay for only what you have used. Cloud computing is a construct that allows you to use applications that actually reside on a location different from your machine location. The cloud environment provides a different virtualized platform that helps user to accomplish their jobs with minimum completion time and minimum costs. Figure 1 shows the framework of cloud. In the cloud computing model, computing power, software, storage services, and platforms are delivered on demand to external customers over the internet. Cloud makes it possible for users to use services provided by cloud providers from anywhere at any time. The high growth in virtualization and cloud computing technologies reflect the number of jobs.



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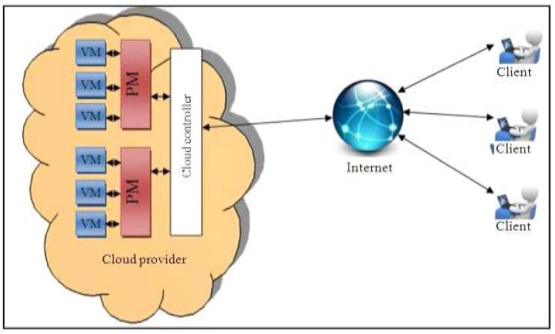
that are increasing nowadays, require the services of the virtual machine. Different types of job scheduling algorithms have been applied on different types of data workloads. And results are measured with different performance parameters to evaluate the performance. Job-scheduling algorithms are developed to accomplish several goals like expected outcome, efficient use of resources, low makespan, high throughput, better quality of service, maintaining efficiency. In job scheduling algorithms, priority of jobs is a challenging issue because some jobs need to be serviced first than those other jobs which can stay for a long time. Suitable job scheduling algorithm must consider the priority of a job [1]. In Fig 1, Cloud computing architecture is presented. Cloud services are divided into three types namely, Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) respectively. Fig 1 shows the essential characteristics of cloud computing such as resource po oling, broad network access, elasticity, on-demand services, physical cloud resources (System Level) and middleware capabilities form the basis provider of delivering IaaS and PaaS in the form of a collection of transparently data centres and runtime environment and composition tools which ease the creation, deployment and execution process of application in the cloud. Finally, to provide the above mentioned services, deployment models such as Public Cloud, Private Cloud, Hybrid Cloud and Community Cloud are used by the cloud providers. The infrastructure of the cloud is provided publicly to all the general public by the organization in public cloud. Anyone can access services from anywhere publicly. Where, private cloud is used for a single organization only. Community Cloud is formed by several organizations and supports a specific community that has shared concerns for their future use. It might be managed by the any one of the shared organization or a third party organization. Last type is Hybrid Cloud, is a cloud formed by the composition of two or more clouds that is private, community, or public. Hybrid computing is bound together by standardized technology which enables data and application portability.



II PROBLEM AND ANALYSIS

A Scheduling model based on minimum network delay using Suffrage Heuristic coupled with Genetic algorithms for scheduling sets of independent jobs algorithm is proposed, the objective is to minimize the makespan.[4].A heuristic for genetic algorithm based task scheduling in multiprocessor systems by choosing the eligible processor on educated guess. From comparison it is found that this new heuristic based GA takes less computation time to reach the suboptimal solution[6]. One primary issue associated with the efficient and effective utilization of mobile resources in a mobile grid is scheduling of tasks. A task scheduling algorithm is proposed based on the dynamic prediction of resource mobility and battery power in the mobile grid environment[7].The goal of the job scheduler is to maximize the resource utilization and minimize the processing time of the jobs. Existing approaches of Grid scheduling doesn't give much emphasis on the performance of a Grid scheduler in processing time parameter. Schedulers allocate resources to the jobs to be executed using the First come First serve algorithm[8].Task scheduling problems are premier which relate to the efficiency of the whole cloud computing facilities. Task scheduling algorithm is an NP- completeness problem which play key role in cloud computing[9]. Ant Colony Optimization (ACO) is random optimization search approach that will be used for allocating the incoming jobs to the virtual machines. The main contribution of our work is to balance the system load while trying to minimizing the makespan of a given tasks set[10]. If a job is of high priority it will have to wait until and unless a job which is getting executed gets over. This may lead to a delay which is definitely going to affect the final result. So, Hybrid approach for load balancing in virtual environment using FCFS, RBAC, Round Robin,

& Priority queue which are going to reduce the burden of the executor[13]. we present a technique that enables existing middleware to fairly manage mixed workloads: long running jobs and transactional applications. Our technique permits collocation of the workload types on the same physical hardware, and leverages virtualization control mechanisms to perform online system reconfiguration[14]. In hybrid clouds, jobs can be allocated on either a private cloud or a public cloud on a pay per use basis. The capacity of the communication channels connecting these two types of resources

that is able to dynamically build performance models of the executing workloads, and then use these models for scheduling purposes. This ability is leveraged to adaptively manage workload performance while observing and taking advantage of the particulars of the execution environment of modern data analytics applications, such as hardware heterogeneity and distributed storage[17]. We first model the selfish behavior of the users supplying resources and aiming to maximize their own benefits, and compute the performance of the resulting non-cooperative equilibrium, which is highly inefficient. We then augment the existing job allocation schemes currently implemented in social cloud systems with a novel class of incentive mechanisms based on reputation-based

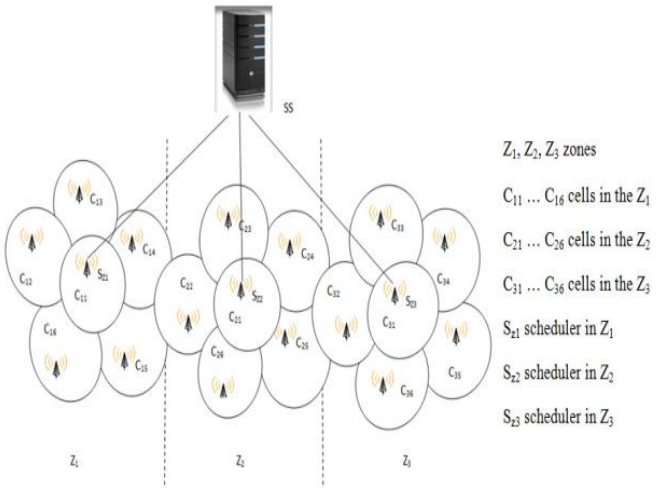
impacts the makespan and the cost of workflow execution[15]. A priority-based method to consolidate parallel workloads in the cloud. We leverage virtualization technologies to partition the computing capacity of each node into two tiers, the foreground virtual machine (VM) tier (with high CPU priority) and the background VM tier (with low CPU priority). We provide scheduling algorithms for parallel jobs to make efficient use of the two tier VMs to improve the responsiveness of these jobs[16]. a scheduling technique formulti-job MapReduce workloads

pricing and collective punishment schemes that compel suppliers to change their selfish strategies in a manner that improves the efficiency of the system[22].

III MECHANISM AND SOLUTION

SCHEDULING

In multiprogramming systems, when there is more than one run able process, the operating system must decide which one to activate. The decision is made by the part of the operating system called the scheduler, using a scheduling algorithm. In the beginning there was no need for scheduling, since the users of computers lined up in front of the computer room or gave their job to an operator.



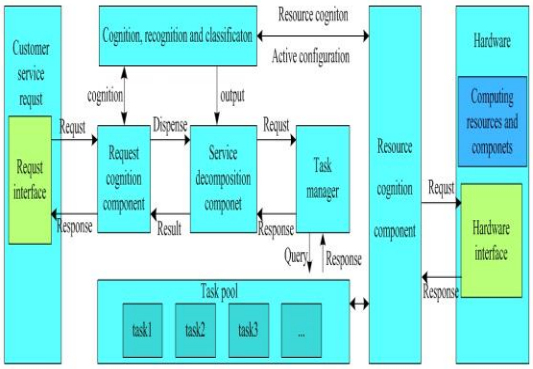
BATCH PROCESSING

The jobs were executed in first come first served manner.

MULTIPROGRAMMING

The scheduler is concerned with deciding policy, not providing a mechanism. Scheduling refers to a set of policies and mechanisms to control the order of work to be performed by a computer system. Of all the resources in a computer system that are scheduled before use, the CPU is by far the most important. Multiprogramming is the (efficient) scheduling of the CPU. The basic idea is to keep the CPU busy as much as possible by executing a (user) process until it must wait for an event, and then switch to another process. Processes alternate between

consuming CPU cycles(CPU-burst) and performing I/O (I/O-burst).



STAGES OF SCHEDULING

In general, (job) scheduling is performed in three stages: short-term, medium-term, and long-term. The activity frequency of these stages are implied by their names. Long-term (job) scheduling is done when a new process is created. It initiates processes and so controls the degree of multi-programming (number of processes in memory). Medium-term scheduling involves suspending or resuming processes by swapping (rolling) them out of or into memory. Short-term (process or CPU) scheduling occurs most frequently and decides which process to execute next.

COMPARISON OF THE EXISTING LITERATURE AND OUR WORK

System architecture	**Server-client**	**P2P**	**P2P**	**P2P**
Resource management	**Centralized**	**Distributed**	**Distributed**	**Distributed**
Supplier	**Obedient**	**Cooperative**	**Self-interested**	**Self-interested**
Incentive Design	**No**	**No**	**Yes**	**Yes**
User interaction	**N/A**	**One-shot**	**One-shot**	**Repeated**
System optimization	**Yes**	**No**	**No**	**Yes**
Monitoring Requirements	**N/A**	**Individual Behavior**	**Individual Behavior**	**Collective Behavior**

COMPARISION

Scheduling Algorithm	Scheduling Method	Scheduling Parameter	Scheduling Factor	Findings	Environment
Resource-Aware-Scheduling algorithm (RASA)	Batch Mode	Make Span	Grouped task	1. It is used to reduce makes pan	Grid environment
RSDC (Reliable Scheduling Distributed In Cloud Computing)	Batch Mode	Processing time	Grouped task	1. It is used to reduce processing time. 2. It is efficient for load balancing.	Cloud environment
An Optimal Model for Priority based Service Scheduling Policy for Cloud Computing	Batch Mode	Quality of Service, Service request time	An array of workflow instances	1. High QoS 2.High throughput	Cloud environment
A Priority based Job Scheduling Algorithm in Cloud Computing	Dependency mode	Priority to each Queue	An array of job Queue	1. Less finish time	Cloud environment
Extended Max-Min Scheduling Using Petri Net and Load Balancing	Batch Mode	Load balancing, Finish time	Grouped Task	1.It is used for Efficient load balancing. 2. Petrin net is used to remove Limitation of max-min algorithm.	Cloud environment
An Optimistic Differentiated Job Scheduling System for Cloud Computing	Dependency mode	Quality of service, Maximum profit	Single Job with Multiple user	1. The Qos Requirements of the cloud computing user and the maximum profits of the cloud computing service provider are achieved.	Cloud environment
Improved Cost-Based Algorithm for Task Scheduling	Batch mode	Cost, Performance	Unscheduled task Group	1.Measures both resource cost and computation performance. 2. Improves the computation communication ratio.	Cloud environment
Performance and Cost evaluation of Gang Scheduling in a Cloud Computing System with Job Migrations and Starvation Handling	Batch mode	Performance, Cost	Workflow With large Number of job	1. The application of migrations and starvation handling had a significant effect on the model. 2. It improves performance.	Cloud environment

SCHEDULING ALGORITHM

First Come First Serve Algorithm:

Jobs are in the queue. so, which come first is first served. This algorithm is simple and fast.

Shortest Job First(SJF):

Which job is execution time is very less, that job is first served.

Round Robin algorithm:

In the round robin scheduling, processes are given a limited amount of CPU time called a time-slice or a quantum in FIFO manner. If a process does not complete execution before its CPU-time expires, the CPU is pre-empted and given to the next process waiting in a queue. And the pre-empted process is placed at the end of the ready queue.

Min–Min algorithm:

This algorithm chooses small jobs to be executed firstly, which in turn large jobs delays for long time.

Max – Min algorithm:

This algorithm chooses large jobs to be executed firstly, which in turn small jobs delays for long time

Random Algorithm

In random algorithm, the selected jobs are randomly selected for execution and assigned to Virtual Machine. The algorithm does not take into considerations the status of the Virtual Machine, which will either be under heavy or low load.

Most fit task scheduling algorithm:

In this algorithm task which fit best in queue are executed first. This algorithm has high failure ratio.

Priority scheduling algorithm:

The basic idea is straightforward: each process is assigned a priority, and priority is allowed to run. Equal-Priority processes are scheduled in FCFS order. The shortest-Job-First (SJF) algorithm is a special case of general priority scheduling algorithm.

IV CONCLUSION

Scheduling is one of the most important task in cloud computing environment. In this paper we have analyze various scheduling algorithm, namely Short Job Scheduling, Priority based Job Scheduling Algorithm, and Enhanced Max-min Task Scheduling Algorithm have been studied and analyzed. Based on their own experimental result, it is shown that some of the scheduling algorithms are beneficial to be used in Cloud computing. There is not a single scheduling algorithm which can solve problem of various types of quality services.

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