A RANDOMIZED STACK CENTRIC RESOURCE SCHEDULING ALGORITHM FOR CLOUD ENVIRONMENT

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Abstract

Real time cloud computing environment has a great impact among the Infrastructure as a service Providers. There are various services which are being offered for various kinds of requirements for the customers. Cloud broker would be very much engaged in providing profitable outcomes for both the Cloud service provider and the end user. There are two types of multiplexing which are being followed for providing pricing discounts to the customers. They are temporal multiplexing and spatial multiplexing. In temporal multiplexing, the broker takes the advantage of Cloud provider hourly billing cycles to use a customer's unused resource for executing other customer's tasks. The goal is to maximize resource utilization so that more customers can be accommodated and in return each can pay less. In spatial multiplexing, the broker takes advantage of volume discount by packing multiple customer's requests to meet the Cloud provider's high threshold for bulk resource purchase, thus, the total cost can be reduced and each can pay less consequently. There are various scheduling algorithms for performing scheduling of resources. In our paper we propose randomized scheduling algorithm (ROSA) which is having its efficient significance in scheduling and allocating the resources effectively. We deploy our cloud environment with Cloud Simulator tool and we use Netbeans IDE and Xampp server for implementing ROSA algorithm. We can be able to prove that ROSA would be superior to the various conventional scheduling algorithms in terms of reduction of cost.

Keywords: **Cloud computing, Concave pricing, ROSA, Spatial multiplexing, Temporal multiplexing.**

I. INTRODUCTION

Cloud computing has the most significant role which would provide resources and data to various computer system over the network. It allows enterprises to get their applications up and running faster, with improved manageability and less maintenance. Cloud computing Technology has made way for several benefits for businesses as well as end users. The most significant benefit is the self service provisioning, Elasticity and Pay per use. Cloud computing have got much demanded because of its service which is provided, such as advantages in high computing power, high performance, cheap cost of the services, scalability, availability as well as accessibility. There are various deployment models in cloud environment. They are Software as a Service, Platform as a Service and Infrastructure as a service. They play a most significant role in providing value added services to the customers. There are stable growth in large scale of public cloud providers like AmazonEC2 [8], Windows Azure [10] and Rackspace [11], small scale cloud providers such as Ready Space [12] and Go Grid [9] have widely emerged. There are two types of multiplexing which are being followed for providing pricing discounts to the customers. They are temporal multiplexing and spatial multiplexing. In temporal multiplexing, the broker takes the advantage of Cloud provider hourly billing cycles to use a customer's unused resource for executing other

customer's tasks [13]. The goal is to maximize resource utilization so that more customers can be accommodated and in return each can pay less. In spatial multiplexing, the broker takes advantage of volume discount by packing multiple customer's requests to meet the Cloud provider's high threshold for bulk resource purchase, thus, the total cost can be reduced and each can pay less consequently. Scheduling is the one of the most prominent activities that executes in the cloud computing environment. To increase overall efficiency of the work load, scheduling is one of the tasks performed to get maximum profit. The main objective of the scheduling algorithms in cloud environment is to utilize the resources properly managing the workload between the resources so that
to get the minimum execution time. In our proposed system, we schedule the entire task request such that the customer is allocated with the resource within the deadline. There are various scheduling algorithms in cloud environment. Some are the significant algorithms are genetic algorithm, bee algorithm, ant colony algorithm, work flow algorithm, load balance algorithm. In our proposed idea, we use Randomized Scheduling algorithm which would help in providing customers as well as cloud service providers with gain in profit. Here we use concave pricing to analysis the performance in graph by taking total no of job requests in x-axis and resource allocated for the job requests in y-axis. So that we can come to conclusion that Randomized Scheduling Algorithm would provide better performance than the traditional algorithms.

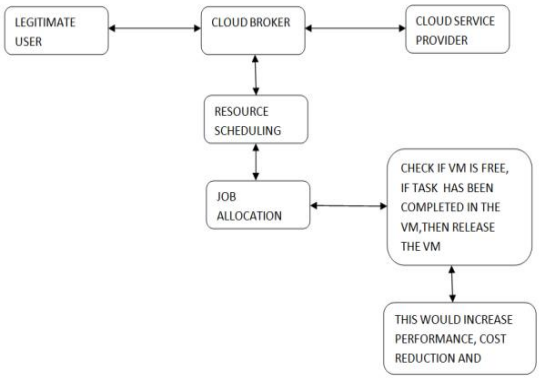

Fig. 1: Brief Diagram for Resource Scheduling and Resource Allocation

The organization of rest of this paper is as follows: Section II presents the Background of Resource Scheduling. Section III presents the Literature Survey and Section IV presents the Existing System, V describes the Proposed System, Section VI presents the Experimental Evaluation, Section VII concludes with Conclusion and Future Direction.

II. BACKGROUND OF RESOURCE SCHEDULING

Online scheduling is required in many cases, because the cloud service provider or service broker may not have information of all tasks in advance and has to make decision with information available so far for online job scheduling when any concave or piecewise concave cost function is used. Resource Scheduling plays a most significant role in the Cloud computing environment. Each and every service are utilized by the users which is obviously referred to as the Resource. Each user requesting resource must be scheduled in such a way that there must be a integrity in the service. Resources are allocated to the legitimate user by the cloud service provider. Efficient scheduling should be provided so that both the user and the service provider gain profit. In cloud
computing, Resource scheduling process is must to have an effective utilization of resources. There are various scheduling algorithms in cloud environment. Some of the significant algorithms are genetic algorithm, bee algorithm, ant colony algorithm, work flow algorithm, load balance algorithm, cost deadline based algorithm. There are some existing algorithms used for pricing which is being analyzed in the organization of the paper.

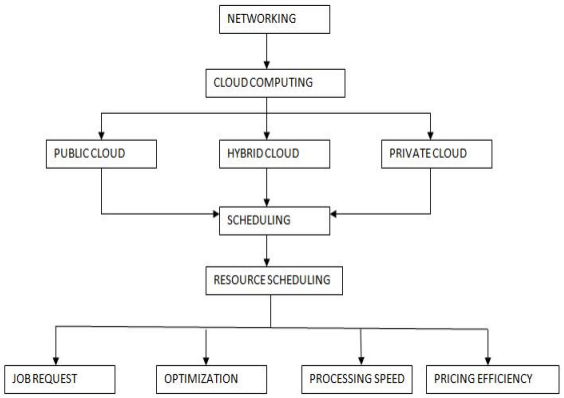

Fig. 2: Taxonomy diagram for Resource Scheduling

III. LITERATURE SURVEY

In this paper Mashayekhy [1], demonstrates that Cloud providers provision their resources such as CPUs, memory, and storage by creating virtual machine (VM) instances which are then allocated to the users. The users are charged based on a pay-as you-go model, and their payment is determined by considering both incentives and the incentives of the cloud providers. Auction markets capture such incentives, where users name their own prices for their requested VMs. Here author design an auction based online mechanism for VM provisioning, allocation, and pricing in clouds that considers several types of resources. This proposed mechanism makes no assumptions about future demand of VMs, which is the case in real cloud environment. The proposed online mechanism is invoked as soon as a user places a request or some of the allocated resources are being released and then become available. The mechanism allocates VM instances to selected users for the period they requests, and then ensures that the users will continue using their VM instances for the entire requested period. Here mechanism determines the payment the users have to pay for using the allocated resources.

In this paper Himani [2], demonstrates that Scheduling is one of the most complicated task in cloud, which aims in scheduling the tasks most effectively which would help in reducing the turnaround time as well as improve performance. Since there are various objectives, the main role is to design, develop a best efficient scheduling technique to do proper separation of tasks on virtual machines. For this, author have used cost deadline based task scheduling algorithm by which it is being proven that approach is more efficient in the these parameters in Task Profit, Task Penalty, Throughput, Provider profit and User loss.

In this paper Aazam [3], the author deals with interoperability of multiple clouds, which can be also called as cloud federation or inter-cloud computing. In the cloud federation, services would be provided via two or more clouds. Once configured, inter-cloud computing can provide services which would be more scalable, better manageable, and most efficient. Those tasks are provided through a middleware entity called cloud broker. A broker is responsible for reserving resources, managing them, discovering services according to customer demands, Service Level Agreement (SLA) negotiation, and matchmaking between the involved service provider and the customer. Here the author has deployed a Holistic Brokerage model in which brokers are managing the users request and server resource utilization simultaneously. This paper concludes that, It would provide a efficient on-demand and advance service reservation, pricing for the cloud users.

In this paper Abbadi [4], author demonstrates about Managing allocation of cloud virtual machines. Current implementations of cloud schedulers do not entirely consider the cloud infrastructure neither do they consider the overall user and infrastructure properties. This results in major security, privacy, and resilience concerns. Author has introduced a Novel cloud scheduler which considers both user requirements and infrastructure properties is proposed. Open Stack is used as a Cloud environment where cloud scheduler is deployed. Comparing the performance metrics, This helps in providing trustworthiness among end users.

In this paper Feng [5], the author demonstrates that, there are increasing count of infrastructure-as-aservice (IaaS) cloud providers who have started to provide cloud computing services, they have form a competitive market to compete for users of these services. Due to different resource capacities and various service workloads, users would observe different finishing times for their cloud computing tasks and experience different levels of service qualities as a result. To compete for cloud users, it is critically very much important for each cloud service provider to select an optimal price for their customers which would be most effective in terms of reliability of service. So here, Game Theory concept satisfying Nash Equilibrium is introduced. It provides Iaas cloud provider to select an optimal prices to compete with the other CSP.

In this paper Toosi [6], author demonstrates that, Infrastructure-as-a-Service cloud providers offer diverse purchasing schemes, in terms of on-demand, reservation, and spot market plans. This would help them to efficiently target a wide range of customers groups with distinct preferences by which more revenue can be generated. It introduces a non-trivial

optimization problem related to the allocation of the provider's available data center capacity to each pricing plan. The complexity of the problem follows from the different levels of revenue generated per unit of capacity sold, and the different commitments consumers and providers make when resources are allocated under a given plan. For this, author has

Deployed Optimal algorithm based on a stochastic dynamic programming formulation and two heuristics that trade-off optimality and computational complexity. This approach would help to increase the revenue for the Iaas service providers.

In this paper Li [7], author demonstrates Cloud computing significance has impacted both academic and industry where data, applications, or processing power are provided as services via Internet. Here the cloud service providers would achieve the economy of scale via virtualization and aggregated computing resources. End users, in the other hand, reach these services with minimal amount of investment. Thereby the increased use of cloud resources and the rise in the number of data centers have made concerns about energy consumption and price. Therefore, this paper addresses the problem of resource provisioning and task scheduling, in order to minimize the pricing of customers and maximize the profit for the CSP.

There are various existing algorithms and their performance metrics which are being analyzed.

Algorithms	Execution Time	Response Time	Cost	Make Span	Scalability	Trust	Reliabilty	Resource utilization	Energy Consumption	Load Balancing	Fairness
Hybrid Energy Efficient Algorithm	✓	×	×	×	×	×	×	×	✓	✓	×
Energy Efficiency using migration	×	✓	×	×	×	×	×	×	✓	✓	×
Near Optimal Scheduling	×	×	✓	×	×	×	×	✓	×	✓	×
Ant colony Algorithm	×	×	×	✓	×	×	×	×	×	✓	×
Dynamic & Load Balancing	✓	×	×	×	×	×	×	×	×	×	×
Chaos Genetic Algorithm	✓	×	✓	×	×	×	×	×	×	×	×
Gang Scheduling Algorithm	×	✓	✓	×	×	×	×	×	×	×	×
Deadline Budget Constraint Algorithm	✓	✓	✓	×	×	×	×	×	×	×	×
Particle Swarm Optimization	×	×	✓	×	×	×	×	×	×	×	×
A Trust Dynamic Scheduling	×	×	×	×	×	✓	×	×	×	×	×

Table 1: Existing Algorithms and their Performance Metrics

IV. EXISTING SYSTEM

Resource scheduling strategy is the key technology in Cloud computing environment. It is a way of determining on which activities should be performed. From the service provider point of view, large scale of virtual machines needs to be allocated to thousands of distributed users, dynamically, and most important it must be profitable. From the customer point of view, they make the decision to use a cloud service by analyzing the quality of service and effectiveness of cost. The optimal task scheduling problem turns out to be minimizing a concave function, which is hard to solve. The lack of complexity in the cost function throws out all existing solutions. Considering the resource scheduling problem for IaaS, multiple customers may submit job requests at random time instants with random workload that should be fulfilled before specified deadline to a broker. We assume that the inter-arrival times for job requests are arbitrary. We know that the processing time for each and every job is known to the broker, where the resources are allocated to the job. The broker is responsible for purchasing computational resource from IaaS clouds, allocating resource and executing jobs, and meeting job deadlines too. The specified deadlines by the customers are flexible. Different from Paas cloud, where the customers directly submit job requests to cloud service providers, brokers mediate the process by organizing the job requests, which would benefit the most from the volume discounts provided by the cloud provider. The major problem dealt is to optimize the pricing of resource utilization for the customer.

V. PROPOSED SYSTEM

The provider take advantage of volume discount by consolidating multiple customer resource requests to meet the provider’s high threshold for bulk resource purchase, thus, the total cost can be reduced and each can pay less consequently. The cloud brokers emerge as mediators between the customers and the providers. Dedicated cloud brokers are emerging, who would help customers in making better decisions. Some of the recent studies show that cloud brokers who mediate the trading process between the customers and the cloud providers can significantly reduce the cost for the customers while helping the cloud providers to cloud broker.

There are various challenges in cloud which are having major impact on scheduling. End users utilize the cloud resources based on the

Infrastructure as a service model where the users pay per use scenario. Pricing is one of the major factor in Cloud computing. Here we are going to derive our proposed idea in implementing Randomized scheduling algorithm which would make the users as well as the cloud service providers with more beneficiaries related to pricing. Basic idea of this randomized online algorithm is to stack the processing times of multiple jobs whenever possible and run the jobs with maximum possible resource in order to reduce total cost. It is to sequentially allocate job in order they are submitted. When scheduler allocates processing time for a job, it always allocates job with the maximum possible resource. When scheduling the workload, we consider time interval within range in order that the interval with the highest scheduled workload comes first. After allocating as much workload as possible to current time interval, we go on to the next interval until all the workload are accommodated. If multiple intervals have same density, we must select a random interval from them to proceed the processing. Such randomization offers an opportunity for the task in consideration to be processed along with future unknown incoming tasks. ROSA is appropriate for dynamic job scheduling. We are going to implement our proposed scheduling strategy by deploying a GUI based cloud application. We perform the simulation in cloud simulator tool. In our cloud application, we would have functions for performing user's task. Users would perform two functions such as Upload and Download of files from the cloud storage. The processing time, waiting time are calculated from the phase of users giving request of task to the phase where the resource is assigned back for the users. Our proposed idea is that we deploy Randomized online scheduling algorithm, which would help for determining the processing delay time for multiple tasks as well, so by calculating it we can determine the remaining space available in the virtual machine, then we can allocate the next task to the corresponding virtual machine. This would help gain profit for both cloud providers and end users. Resource utilization would be efficient by this kind of strategy.

VI. EXPERIMENTAL EVALUATION

In our proposed system, for deploying a cloud environment, we have used Cloud Simulator tool. We deploy a GUI application for cloud environment by using Java language in Netbeans IDE. For the back end connectivity, we have deployed Xampp server. We have developed the application for processing of user task request. In our GUI application process, we have taken user file download and user file upload as two main functions which user would perform. In the process, for multiple users job request, randomized scheduling with delay time algorithm is carried out in which job with the maximum workload is being processed first. We have partially implemented our proposed system. Further implementation is in progress. By this, we would be able to determine the processing time as well as the waiting time of the Job by which we can prove that our proposed randomized algorithms are superior to the traditional algorithms.

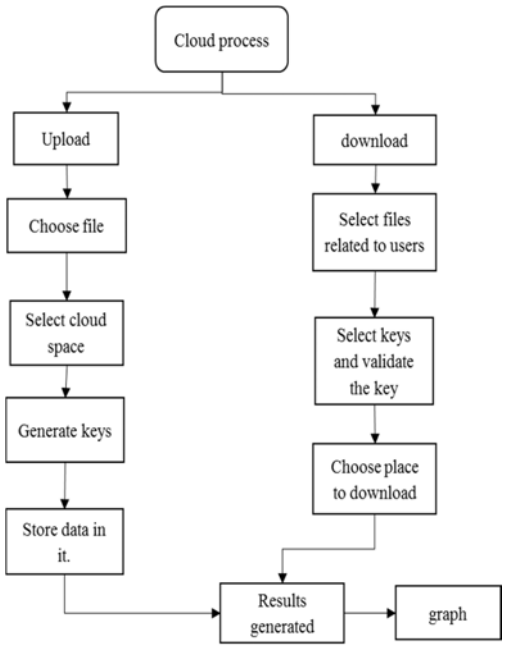

Fig.3: Data flow diagram of user Tasks

These are the various user tasks we have deployed in the GUI Application. The main reason for creating GUI application to perform ROSA scheduling algorithm is to make a user friendly interface approach.

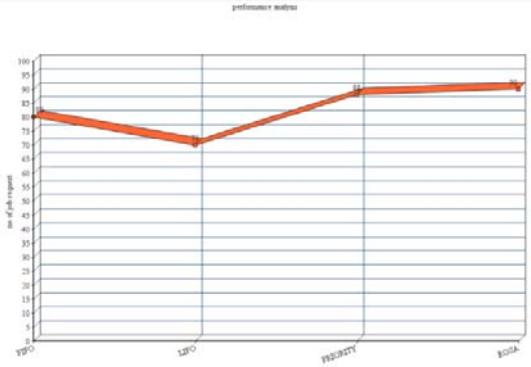

Fig.4: Performance Analysis

We have taken various scheduling algorithms and their performances are analyzed. From that, we can determine that ROSA would be better in performance than the other traditional scheduling algorithms.

VII. CONCLUSION AND FUTURE DIRECTIONS

Cloud is an emerging environment in which cloud providers, brokers, and users share, mediate, and consume computing resource. In cloud computing environment, Pay-as-you-go pricing model has been diversified with volume discounts to stimulate the users' adoption of cloud computing. This paper studies how a broker can schedule the jobs of users to provide the pricing model with volume discounts so that the maximum cost saving can be achieved for its customers. Concave pricing is process of taking a randomized task from the users and analyzing the efficiency of their resource utilization by which we can conclude that pricing of the users cost can be reduced effectively. In our proposed work, we would perform randomized resource scheduling mechanism in CloudSim, a cloud simulation Environment. Our proposed idea of Randomized scheduling would help in increasing the efficiency for utilization of resource. This would also help in reduction of cost for end users as well as Cloud service providers.

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