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Efficient Resource Utilization under Discount Pricing in Cloud Computing

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Abstract: **In the cloud computing environment, computational resources are readily and elastically available to the customers. In order to attract customers with various demands, most Infrastructure-as-a-service (IaaS) cloud service providers offer several pricing strategies such as pay as you go, pay less per unit when you use more (so called volume discount), and pay even less when you reserve. The diverse pricing schemes among different IaaS service providers or even in the same provider form a complex economic landscape that nurtures the market of cloud brokers. By strategically scheduling multiple customers' resource requests, a cloud broker takes the responsibility of distributing the discounts offered by cloud service providers. In this paper, we focus on how a broker can help a group of customers to fully utilize the volume discount pricing strategy offered by cloud service providers through cost-efficient online resource scheduling. We present a randomized online stack-centric scheduling algorithm (ROSA) to practically prove the cost deviation with mathematical formulation.**

Keywords: **Cloud Computing Environment, scheduling multiple customers' resource requests.**

1. INTRODUCTION

Nowadays in the cloud market, the cloud providers offer big discounts for reserved request. Cloud providers such as Amazon EC2 cloud gives 10% discount for customers spending $25,000 or above on reserved instances .It also provides 20% discount for customers spending $200,000 or above. But the purchase of such a large amount of resource is not affordable to the end users. Thus the cloud brokers emerge as the mediators between the providers and the customers. Generally cloud provides adopt the hourly billing scheme, though the customers need to pay for their unused resources. But here cloud brokers emerge as the mediators to reduce the cost of purchasing through temporal multiplexing and spatial multiplexing of resources.

- By temporal multiplexing the customers unused resources are utilized by the other customers.
- By spatial multiplexing the volume discounts are enjoyed by packing the multiple customers' request.

Thus each can pay less. So the cost of purchasing from broker becomes low due to volume and reserved discounts, When compared to the cost of purchasing without discount.

2. PROBLEM FORMULATION

Multiple customers may submit requests at random instants with random workload that should be fulfilled before specified deadline to a broker. We assume that the inter-arrival times for requests are arbitrary. We assume that the processing time for each is deterministic and known to the broker given the resource allocated to the customers. The broker is responsible for purchasing computational resource from clouds, allocating resource to and executing jobs, as well as meeting job deadlines.

The deadlines specified by the customers are fixed. Different from cloud, where the customers directly submit job requests to cloud service providers, brokers mediate the process by organizing the job requests in a manner which benefits the most from the volume discounts provided by the cloud provider. Both the cloud provider and the customers benefit from this mediation. Individual customers can enjoy volume discounts which often require a large volume of job requests.

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The cloud provider benefits from the revenue boosted by the brokerage. To ease analysis, we assume that time is slotted, and jobs arrive at the beginning of a time slot. In any unit time slot, a job either is allocated with no resource or uses allocated resource in the whole time slot, unless otherwise stated.

3. SYSTEM MODEL

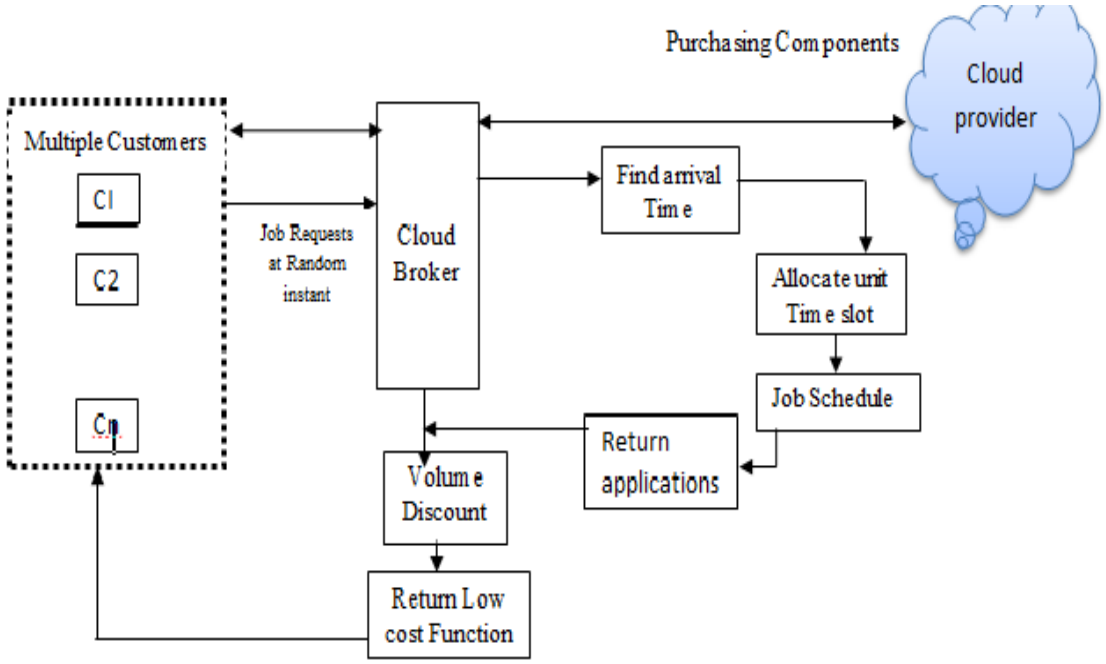

Fig.1.Optimal scheduling using cloud broker

This figure illustrates the three functionalities such as 1) Job request 2) scheduling 3) volume discounts .Initially multiple customers sends the job request to the cloud broker. The cloud broker finds the inter arrival time and allocate the unit time slots.

Thus the job scheduling is done efficiently .Broker performs low cost function operation to return cost with volume discount. Thus the cost of purchasing from the cloud broker is lesser than the cost of purchasing from provider. So end users can enjoy the volume discounts efficiently.

4. SYSTEM DESCRIPTIONS

4.1 users:

User registration after login to different pricing for downloading file from brokers. So that a higher volume discount can be enjoyed due to the higher amount of total requested resource of the brokers.

4.2. Cloud Provider:

The provider takes customers advantage of volume discount by packing multiple customers' resource requests to meet the providers' high threshold for bulk resource purchase, thus, the total cost can be reduced and each can pay less consequently. While the advantages of temporal multiplexing have been thoroughly investigated before , the benefit of spatial multiplexing remains less explored.

4.3. Cloud Broker:

The cloud brokers to emerge as mediators between the customers and the providers. Dedicated cloud brokers are emerging to help customers make better purchase decisions. Recent work shows 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

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4.4. Cloud computing:

Cloud computing is a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (for example, networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service-provider interaction.

4.5. Bulk Purchasing:

Bulk purchasing is when a consumer captures part of the benefits of economy of scale for himself by doing with the retailer what the retailer does with the wholesaler: paying a lower price per unit in exchange for purchasing much larger quantities. This allows the consumer to satisfy more of his demands at a lower total cost by acquiring more user value dollar spent.

4.6. Discount Pricing:

Discount pricing depends on the firm's average cost, and on the customer value of the product in comparison to his or her perceived value of the competing products. Different concave pricing methods place varying degree of emphasison selection, estimation, and evaluation of costs, comparative analysis, and market situation**.**

5. EXPERIMENTAL SETUP

This experiment was simulated using cloud sim with java eclipse as front end and SQL yog as back end.Thus the corresponding outcomes where obtained with it.

5.1Experimental evaluation:

- For example one instance cloud usage price is Rs.1000/- . if the user uses the resources then the discounted amount will be given as,
- Discount=initial amount * discount percentage

  =1000*20%=200
- Then the paid amount = initial amount- discount

  = 1000-200

  = Rs.800/-

Thus the end user can purchase the resource for Rs.800 instead of Rs.1000, So that the customer gains Rs.200 for one instance of purchase. Thus the cloud brokerage benefits the customers effectively and financially.

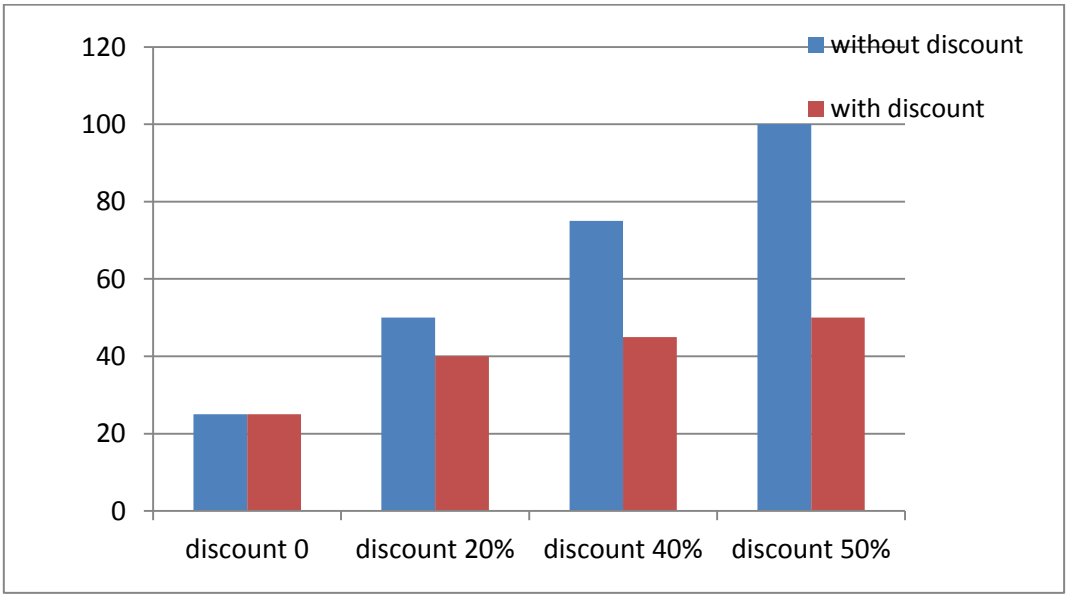

Fig.2.Variation in pricing with discounts

6. CONCLUSIONS

Cloud is an emerging computing market where cloud providers, brokers, and users share, mediate, and consume computing resource. With the evolution of cloud computing, 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 leverage the pricing model with volume discounts so that the maximum cost saving can be achieved for its customers.

We have analyzed the properties that an optimal solution should have and studied three special cases of the concave cost scheduling problem. We developed an online scheduling algorithm and derived its competitive ratio. Simulation results on cloud sim shown that the proposed online scheduling algorithm outperforms other conventional scheduling algorithms. Although continuous concave cost functions and piece-wise linear cost functions are used to conduct the evaluation, the properties proved and the online algorithm proposed apply to all piecewise concave cost and cost saving.

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