

Optimized the Pricing Scenario Base on Time in Cloud Environment

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ABSTRACT: we study the problem of how to optimize a cloud service provider's pricing policy so as to better compete with other providers. Different from previous work, we take both the evolution of the market and the competition between multiple cloud providers into consideration while optimizing the pricing strategy for the provider. Inspired by the real situations in today's cloud market, we consider a situation in which there is only one provider who actively optimizes his/her pricing policy, while other providers adopt a follow-up policy to match his/her price cut. To compute optimal pricing policy under the above settings, we decompose the optimization problem into two steps: (1) When the market finally becomes saturated, we use Qlearning, a method of reinforcement learning, to derive an optimal pricing policy for the stationary market; (2) Based on the optimal policy for the stationary market, we use backward induction to derive an optimal pricing policy for the situation of competition in an evolutionary market. Numerical simulations demonstrate the effectiveness of our proposed approach.

KEYWORDS: Pricing and Resource Allocation, Prediction., IaaS, pricing scheme, utility function

I. INTRODUCTION

In recent years, cloud computing has become very popular and been accepted by both enterprise users and personal users since it can provide economical, scalable, and elastic access to computing resources over Internet. Cloud market is increasing tremendously and research is being done to improve its services. Infrastructure as a Service (IaaS) has become key factor in providing elastic compute resources. Many scientists, companies, government agencies are migrating to Cloud Computer to fulfill their computing needs as it's a hassle free way of accessing powerful and efficient processors. Refined resource allocation and precise pricing are two main issues in provisioning virtual machines on Cloud environment. There are multiple ways a customer is charged for cloud services by provider like pay as you go method which considers CPU usage, memory consumption etc. Pricing is critical as directly affects provider's income and customers pockets. Designing a perfect pricing system which can satisfy both customer and provider in IaaS environment is difficult job. Course-grained pricing schemes which are utilized by Amazon EC2 charge for atleast one hour of cloud time. This approach is not good for short time job executers as they have to pay for full one hour even if they use it for few minutes only. This is called as partial usage waste. This is a common scenario in IaaS environment as cloud jobs are usually of short duration.

However, it is a very challenging task for a cloud provider to optimize his/her pricing policy mainly because of two reasons. First, the cloud market is non-stationary. The market grows very fast in recent years before eventually becoming saturated.² The optimization of pricing policies needs to consider market dynamics and the long-run profit of the cloud provider. Second, there are usually multiple providers offering very similar cloud services. The competition between providers who offer similar services plays an important role for pricing policy optimization. In optimized fine-grained pricing scheme, it is ensured that users are needed to pay less and providers can earn more by utilizing resources by optimizing allocation time. In other schemes like in pay-as-you-go pricing scheme, user pays for idle time of instance. Also there is a overhead of VM start-up time, shut down and changing resource tuning. Optimized-fine grained approach considers this VM maintenance overhead and adjusts billing to maximize social welfare. Also optimal price for both customers and providers is derived to maximize total utility. Overall it's a win-win situation for both.

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II. LITRETURE SURVEY

This research work explores the issues to application providers on how to effectively provision or subscribe VM resources from an IaaS provider, areas related to other work include the following: 1) Pricing model of cloud resources; 2) Resources Provisioning for cloud computing; and 3) Resource Demand Prediction.

In [1], Ren-Hung Hwang et al. proposed two subscription plan namely long-term reservation and on-demand subscription. To make properly resource provisioning and minimize service provision cost, two phase algorithm were used. In [2], Roussopoulos et al. proposed a microeconomic inspired approach to determine the number of VMs to be allocated to each user by their financial capacity, then maximizing per-user's profit and effectiveness of sharing. In earlier work such as [3], applied a queuing model to analyze the response time distribution for two classes of job; moreover, a heuristic algorithm was developed to obtain the smallest number of servers without violating the SLAs. However, in a real world situation, most of IaaS providers offer several pricing options: reservation, on demand, and spot. Reservation option is suitable for long term provisioning. A customer signs a long term lease contract with the IaaS provider to reserve a fixed amount of resources. Usually, it includes an upfront fee for signing the contract and a usage fee per instance and unit of time for actual use of the resources. On-demand option is suitable for dynamic provisioning. A customer can ask for resources on a pay per use- basis at any time. The Amazon EC2 also provides the spot option, which allows a customer to submit a bid price to compete with remained resources. Calheiros et al. [4] analyzed a provisioning technique that automatically adapts to workload changes related to applications for facilitating the adaptive management of system and offering end-users guaranteed Quality of Services (QoS) in large, autonomous, and highly dynamic environments. They model the behavior and performance of applications and Cloud-based IT resources to adaptively serve end-user requests. To improve the efficiency of the system, they use analytical performance (queuing network system model) and workload information to supply intelligent input about system requirements to an application provisioned with limited information about the physical infrastructure.

Mao et al. [5] proposed a cloud auto-scaling mechanism to automatically scale computing instances based on workload information and performance desire. The mechanism schedules VM instance startup and shut-down activities. It enables cloud applications to finish submitted jobs within the deadline by controlling underlying instance numbers and reduces user cost by choosing appropriate instance types. They have implemented mechanism in Windows Azure platform, and evaluated it using both simulations and a real scientific cloud application. Chaisiri et al. [6] studied the the optimal long term reservation plan and on-demand plan. They formulated the optimal long term reservation plan problem as a stochastic programming model by assuming that the distribution of workload demand and price model was known in prior. However, the computation complexity is too high and the assumption is not practical. In [7], two provisioning algorithm for long-term and short-term planning were proposed. The long-term plan was determined by subscribing reserved instances for the long-term usage. Inside the long-term plan, multiple short-term plans were triggered to provide enough numbers of spot instances for capacity supporting. Even though they developed the short-term plan, they overlooked the time delay to launch a new VM. Mark et al. [8] adopted a demand forecaster to predict the future workload such that occurrences of over provisioning could be reduced. Nevertheless, their prediction mechanism was only used in the reservation phase and the delay of dynamic resource provision was neglected in the on-demand phase.

III. OBJECTIVES OF SYSTEM

Our objective is to minimize the operational cost by virtue of optimal resource reservation and predictive adjustment of resource usage. The following techniques were used to achieve the objective:

- 1) For Long term resource reservation, aimed to find the amount of resources to be leased such that the operational cost could be minimized, assuming that insufficient resources at any time instance could be dynamically and instantaneously allocated on demand. The resource reservation plan included the lease period, types of VM and their quantity to be reserved.
- 2) For on-demand resource allocation, adopted the kalman Filter to predict workload demand; the VM configuration problem was formulated. The VM configuration problem took into account of VM launch or shutdown to reflect the change of workload demand.

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IV. PROBLEM STATEMENT

In the proposed research work we propose a novel optimized fine-grained fair pricing scheme by taking into account the VM maintenance overhead, and find a best-fit billing cycle to reach the maximized social welfare. Intuitively, the profits of both sides contradict to each other, such that win status is hard to guarantee. We derive an optimal price point which can satisfy both users and providers with maximized total utility.

Proposed System

In a coarse-grained hourly pricing, economical inefficiency for short-job users is high. waste happens very frequently as cloud jobs are usually short. Some users try to aggregate their jobs using in house experts or through brokers to utilize the whole instance of IaaS. But this again is not full proof technique to handle this issue. Hence there is a need of solution to partial waste issue. Also its important to optimize the trade off between adopting the refined pricing scheme and controlling the impact of extra overheads with decreasing length of billing cycles.

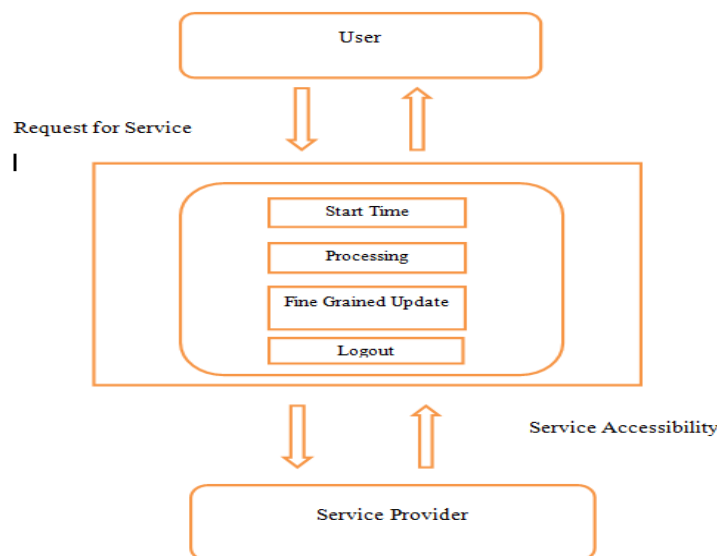


Figure 1: proposed system architecture

Optimized fine-grained reasonable taking so as to valuing plan are executed into record the two vital things that are VM support overhead, and locate a best-fit charging cycle to come to the amplified social welfare (i.e. the total of the cost decreases for all client and the income picked up by the provider).to advance the fine-grained proposing so as to valuing plan three calculations with in regards to VM-support overheads: registering most extreme client acknowledged cost and figuring least supplier acknowledged cost and augmenting the social welfare. With these three calculations, one can without much of a stretch discover state fulfilling both clients and suppliers the length of the last cost is set in the satisfactory valuing range.

our improved fine-grained taking so as to estimate model VM support overhead into thought. Our fundamental goal is to fulfill both clients and suppliers, and achieve most extreme social welfare in the interim. As of late, the estimating plots extensively received in IaaS cloud business sector can be classified into three sorts: pay-as-you-go offer, membership alternative and spot market. Under the pay as-you-go plan, clients pay a settled rate for cloud asset utilization per charging cycle (e.g., 60 minutes) with no dedication. On-Demand Instances are regularly used to run short-occupations or handle occasional movement spikes. In the membership plan, clients need to pay a forthright charge to hold assets for a specific timeframe (e.g., a month) and thusly get a noteworthy value markdown. The charging cycles in the membership plan are moderately since quite a while ago contrasted with the pay-as you-go conspire, and can be one day, one month, or even quite a while. In this manner, it is suitable for long-running occupations (such as logical processing).

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V. ALGORITHMS

Algorithm 1 Computing maximum price that can be accepted by users

Input: The length $Lu(i)$ of User u 's all jobs.

Output: A vector which contains the maximum prices, $Max Pu; K$ that can be accepted by the user.

Step 1: Calculate $Costu;60$ for all of the user's jobs with hourly pricing.

Step 2: for all billing cycles K do

Step 3: Calculate the total number of billing cycles for all of u 's jobs based on the fine-grained pricing.

Step 4: Calculate the value of $Max Pu; K$.

Step 5: end for

Algorithm 2: Scheduler algorithm

Step 1: Verify user authentication

Step 2: if (authenticated)

Grant for service

Step 3 : Start timer T

Step 4: Update time in processing

Step 5: User logout request

Step 6: Update current T to database D

Step 7: Logout success

VI. MATHEMATICAL MODEL

$S = \{M1, M2, M3, M4\}$

S is the main system it holds the four different modules. $M1$ first execute the admin phase which set the all pricing module. $M2$ introduces the user authentication module, $M3$ will work at the time user service accessing and meanwhile update the service pricing and timings. $M4$ finally display all analysis graphs as well user usage details.

$M1 = \{p1, p2, \dots, pn\}$

$M1$ hold the set of multiple services like $p1, \dots, pn$ each service having own identity and execution.

$M2 = \{U1, U2, \dots, Un\}$

These are list of users who registered with the system. Once registered any user he can access the service after secure authentication.

$U(i) = \{p1, p2, p3, \dots, pn\}$

Each i th user can associate with each service.

$M3$ update the pricing module user time usage.

$M4 = \{g1, g2, gn\}$ these the analysis graphs

- $VMCost$: the hourly cost for renting a VM instance;
- $NVMsComp$: the number of VM instances used for computation;
- $NVMsData$: the number of VM instances used for data acquisition (i.e., in the Copy & Compute scenario);
- $CompRateTotal$: the number of events processed per second in the system, for Stream & Compute (SC) or Copy & Compute (CC) scenarios;
 - $TotalEvents$: the total number of events to be processed;
 - $SizeEv$: the total size of the events to be processed;
 - $StorageCost$: the cost of storing the data on persistent storage for the duration of the computation (i.e., in the Copy&Compute scenario);
 - $GBHCost$: the cost of storing 1 GB of data for 1 hour, which is computed as the $StorageCost$ divided by the number of hours in a 30-day period (the considered number of days in a month), i.e., 720 hours. Using these parameters, we can express the cost for processing a given amount of events as the time needed to process them multiplied by the corresponding cost of the VM instances used.

$TotalCost = TotalEvents / CompRateTotal * (NVMsData + NVMsComp) * VMCost + StorageCost$

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Success condition

When $M1 \neq \text{null}$

Failure condition

$M1 = \text{Null}$ and $U(i)$ cant able to access $\{p1, p2..pn\}$

VII. RESULTS AND DISCUSSION

In the proposed system we suggest minimum 5 minutes billing cycle for all users. Some system having best fit billing cycles which is not suitable for minimum time usage users like 5 Min, 10 Min etc. So, here the dynamic billing cycle is affordable for any kind of user. We also evaluate the fix billing cycle of overall users and it is more efficient for all users as well vendors. Once any users use the resources that time its confirm how billing cycle works that's why proposed approach is efficient than others because user don't want to accept new pricing scenario to finish the same workload using highest cost. Below figure 2 shows the proposed billing cycle usage. X shows the type of users and Y shows the total number of percentage of users used the specific services.

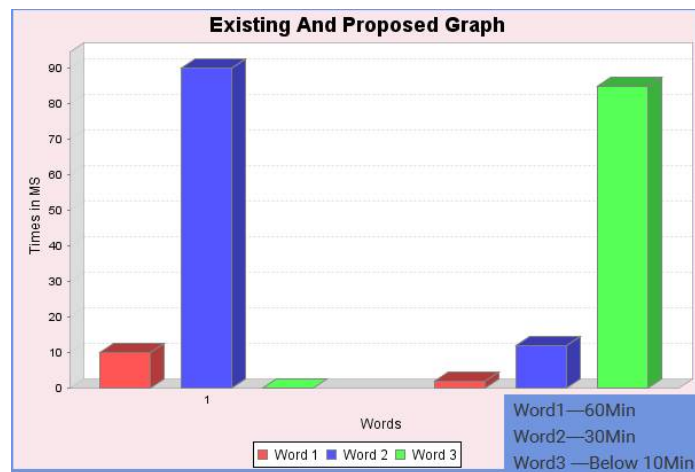


Figure 2: usage details of providers proposed vs existing

Here below figure 3 shows the existing and proposed system comparison for usage. There is no below 10 minutes billing cycle in existing approaches. Here Y shows the total number of percentage users used the service and X shows the users with time.

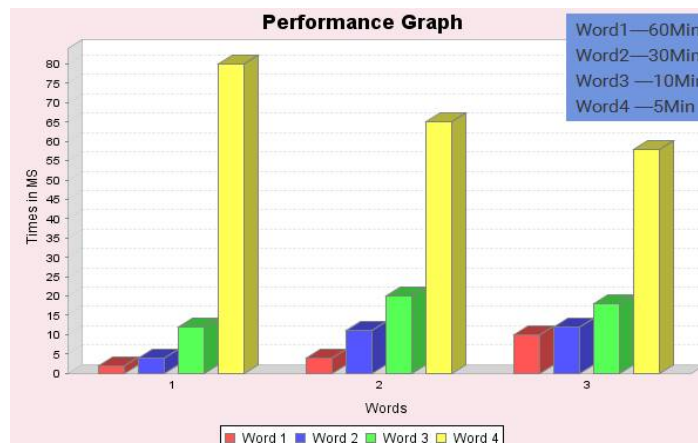


Fig 3: Used detail of proposed system

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Here system is affordable for that 5-minutes is a proper fixed billing cycle for the IaaS provider for several reasons. First, the social welfare at 5-minutes billing cycle is almost the same as the maximization for both traces as illustrated in Fig. 1. Second, the 5-minutes billing cycle can be accepted by most users.

VIII. FUTURE WORK

We will do research on following area of cloud pricing. We will try to consider both user and providers concerns of changing demand and its cost. This will ensure both provider and customers benefit. Apart from this we will consider competitive prices and its effect on pricing. We will study best fit auction based pricing to support optimized fine grained scheme. Also partial waste issue is a area of study which can result in reduced prices using precise scheduling of users' job. User scheduling behaviours and partial usage waste will be brainstormed to find an effective solution.

IX. CONCLUSION

We have proposed a Optimized fine-grained cloud pricing scheme in this paper. This solution will solve partial wastage issue of Cloud bandwidth allocated to user. Maximized total utility is derived from optimal pricing for Customers and Cloud Providers satisfying both the parties. This optimized fine-grained cloud pricing scheme recognize, learn and provide dynamic solution to minimize partial usage waste issue by analysing scheme's result with real life data from clouds. It is expected that this solution will eliminate or reduce partial wastage issue of Cloud Bandwidth and will provide best prices for billing cycles to give best social welfare. With application of functional premise in finances, we originate an optimal price to assure equally customers and providers with maximized total functions. We appraise our optimized cloud pricing model by applying it to extensive production logs, with association to the standard cross-grained hourly pricing-model.

Future Work

In this paper, we have modeled the evolutionary cloud computing market and studied how to maximize the long-run profit of a proactive provider when competing with other reactive providers. To handle the non-stationary market, we have proposed two algorithms to find an optimal pricing policy: The Q-learning algorithm works for the situation when the market has evolved to a stationary state, and the backward induction algorithm works for the evolving and non stationary market environment. Overall speaking, our analysis has simulated possible price evolutions in different scenarios. These results on one hand could explain the observed trend in today's cloud computing market, e.g., the fierce price competition at the initial market development stages. They, on the other hand, also provide insights on the appropriate actions that the proactive provider should take in different situations

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