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# Towards Optimized Fine-Grained Pricing of IaaS Cloud Platform: A Survey

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**ABSTRACT:** Even if there are many pricing schemes for IaaS platforms present like pay as you go and subscription spot market policy, there is a loss of money paid for service due to course-grained pricing system. In this proposed research work we present a Optimized Fine-Grained Pricing scheme. Two issues are addressed here as first profit of cloud provider and customer often contradict and second VM-Maintenance cost overhead like startup time are considerably high. We can derive optimized pricing for both Cloud User and Service Provider. This also will help to find best billing cycle for maximizing social welfare. We compare proposed system against classical fine-grained pricing scheme which considers Hourly billing. We demonstrate a solution which will benefit Customers and Providers both.

**KEYWORDS:** Cloud computing, IaaS, pricing scheme, utility function

## I. INTRODUCTION

**C**loud has become a day to day word for many these days. Cloud computing has become most favorite technology amongst all business areas. 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.
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.

## II. LITRETURE SURVEY

An appropriate pricing scheme which can make both providers and customers satisfied is becoming a major concern in IaaS environment. In Amazon EC2, for example, the smallest pricing time unit of an on-demand instance is one hour. Such a coarse-grained hourly pricing is likely to be economically inefficient for short-job users. For instance, users have to pay for full hour cost even their jobs just consumed the resources with a small portion (such as 15 minutes) of the one-hour period. Such a phenomenon is called partial usage waste, which appears very often as cloud jobs are quite short in general. Based on the recent characterization of Cloud environment versus Grid systems, cloud jobs are usually much shorter (such as dozens of minutes) than Grid jobs (such as dozens of hours or days). This will

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induce serious partial usage waste issue. The current hourly pricing scheme probably induce idle charged resources especially for short jobs, while the fine-grained pricing scheme not only makes users pay less but also makes provider gain more due to the optimization of unit price for the same service time and more users served. From that we are surveying that pricing scheme designed for IaaS cloud platform are implemented from various point of view and considering various types of issues.

In paper [1], to design a resource allocation algorithm with high prediction-error tolerance ability, also minimizing users payments subject to their expected deadlines.

In paper [2], Infinite horizon revenue maximization framework to tackle the dynamic pricing problem in an infrastructure cloud. The technical challenge compared to previous pricing work is that prices are charged on a usage time basis, and as a result the demand departure process has to be explicitly modeled. An average reward dynamic program is formulated for the infinite horizon case. Its optimality conditions and structural results on optimal pricing policies were presented. They showed that the relative rewards as well as the optimal price exhibit monotonicity, which is resonant with previous result.

In paper [3], Semi elastic cluster (SEC), a new execution model for HPC in the cloud that manages variable-size clusters to be shared by many users within an organization. This model brings new roles to traditional batch job scheduling algorithms, by incorporating resource provisioning and management problems into parallel scheduling. From our design and evaluation, we argue that SEC can potentially become a viable alternative to organizations owning and managing physical clusters. In addition, found that by performing load aggregation and instance reuse simultaneously, SEC can deliver significantly better cost-effectiveness without hurting user experience, compared to using the standard on-demand cloud clusters.

In paper [4] investigate some of the ways in which data can be managed for work flows in the cloud.

In paper[5], analyzed the relationship between the VM startup time and different factors, extract useful information, compare the performance across three cloud providers and make recommendations whenever possible. Updated performance results periodically.

In paper [6], aim at optimizing fault-tolerance techniques based on a check pointing/restart mechanism, in the context of cloud computing.

In paper [7], by analyzing the spot price histories of Amazon's EC2 cloud they engineer how prices are set and construct a model that generates prices consistent with existing price traces. They would especially like to sell the capacity of machines which cannot be turned off and have higher overhead expenses. Clients might be enticed to purchase this capacity if they are provided with enough incentive, notably, a cheaper price.

In paper [8] Set of bidding strategies to minimize the cost and volatility of resource provisioning. Essentially, based on this model, we are able to obtain an optimal randomized bidding strategy through linear programming. Using real Instance Price traces and workload models, we compare several adaptive check pointing schemes in terms of monetary costs and job completion Time and evaluate our model and demonstrate how users should bid optimally on Spot Instances to reach different objectives with desired levels of confidence.

In paper [9], Design, develop, and simulate a cloud resources pricing model that satisfies two important constraints: the dynamic ability of the model to provide a high satisfaction guarantee measured as Quality of Service (QoS) from users perspectives, profitability constraints from the cloud service providers perspectives.

In paper[10],they propose two solution methods based on the best-reply dynamics and prove their convergence in a finite

number of iterations to a generalized Nash equilibrium. In particular, we develop an efficient distributed algorithm for the run-time allocation of IaaS resources among competing SaaS providers. And demonstrate the effectiveness of our approach by simulation and performing tests on a real prototype environment deployed on Amazon EC2. Results show that, compared to other state-of-the-art solutions, our model can improve the efficiency of the Cloud system evaluated in term of Price of Anarchy by 50-70%.

## III. PROBLEM STATEMENT

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

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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.
In the pay-as-you-go cloud pricing, short-job users have to pay more than what they actually use, and incur numerous idle instance time for the provider. We first raise the partial usage waste issue, and then prove its significance by analyzing it with real-world production traces. 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. Our scheme also proves that refined fine-grained pricing is not bad news for service providers, because they can keep or even increase their revenue with our scheme.

## IV. PROPOSED SYSTEM

Cloud computing poses new challenges to solving revenue maximization problems. First, little is known about how the spot price is adjusted, and what factors are considered in the pricing algorithm, by a real-world provider such as Amazon. Also, little is known about demand statistics, and how
demand reacts to price changes. In fact, though Amazon publishes its spot price history, very few insights are gained on important aspects related to modelling of the market.
Second, for a cloud provider, revenue not only depends on the number of customers, but also on the duration of usage. Thus, not only the arrival but also the departure of demand is stochastic, and have to be taken into account when collecting revenue. This clearly adds to the modelling complexity. we consider the scenario where the cloud provider with fixed capacity updates the spot price according to market demand in this paper. Our second contribution is that we formulate the revenue maximization problem as a finite-horizon stochastic dynamic program, with stochastic demand arrivals and departures. We characterize optimality conditions for the stochastic problem and prove important structural results.
We also extend our model to the case with non-homogeneous demand. We conduct an asymptotic analysis on this more general but difficult problem. We prove a surprising result that when the demand arrival and departure rates are linear with system utilization, i.e., number of existing instances, the optimal price is only a function of time and is independent of the system utilization.

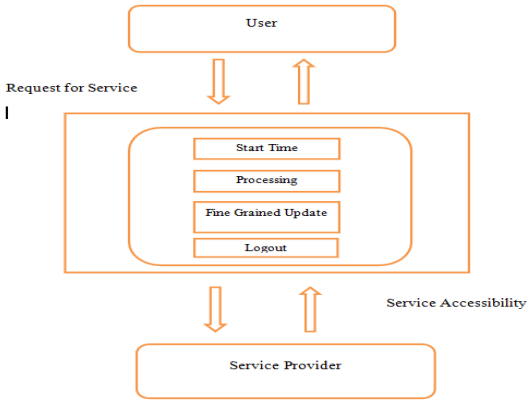


**Fig 1.: Proposed System Module**

**Mathematical Model**
S= fM1,M2,M3,M4g
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,p2pn
M1 hold the set of multiple services like p1.pn each service having own identity and execution.

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M2=U1,U2Un
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..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
Success condition
When M1!=null
Failure condition
M1==Null and U(i) cant able to access p1,p2..pn

## V. CONCLUSION

Here an optimized fine-grained pricing to solve the partial usage waste issue, with regard to the inevitable VM-maintenance overhead is proposed. An optimal price (the middle point in the range) to satisfy both customers and providers with maximized total utility is derived. The proposed optimized fine grained pricing scheme recognize, learn and provide dynamic solution to reduce the partial usage waste problem in cloud computing by analyzing its implication with real-world traces. We intend an optimize fine-grained pricing model to resolve the partial usage waste problem, with regard to the predictable VM maintenance in the clouds, and discover a best-fit billing cycle to exploit the social welfare. By applying the functional premise in finances, we originate an optimal price to assure equally customers and providers with maximized total functions. We appraise our optimized pricing model by using two extensive production traces, with association to the standard coarse-grained hourly pricing-model.

## VI. FUTURE WORK

The following research issues are planned for the future work. First, our approach mainly focuses on the IaaS provider's perspective but not the users' perspective. In the future, we will explore a dynamic solution to cope with the changing demands of users and providers. Second, the design of pricing can be affected by the market forces due to the competitiveness among resource providers. Our approach has not considered the influence on pricing caused by the market forces. We plan to exploit the best-fit auction based policies to suit the new fine-grained pricing scheme in the future. Third, the partial usage waste problem can be alleviated by scheduling users' jobs effectively. In the future, we plan to investigate a pipeline solution for the partial usage waste problem combined with users' scheduling knowledge.

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