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An Efficient Auction Mechanism in Cloud Computing For Computing Jobs with Soft Deadlines

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Abstract: This system thinks about the cloud market for figuring occupations with culmination due dates, and outlines proficient on the web auction/barters for cloud asset provisioning. A cloud client offers for future cloud assets to execute its activity. Each offer incorporates: (a) an utility, mirroring the sum that the client is ready to pay for executing its activity and (b) a delicate due date, determining the favored complete time of the activity, and in addition a punishment work that describes the cost of disregarding the due date. We target cloud work auction/barters that executes in an online manner, keeps running in polynomial time, gives honesty ensure, and accomplishes ideal social welfare for the cloud environment. Towards these objectives, we use the accompanying exemplary and new sale plan methods. To begin with, we adjust the posted estimating sell off structure for inspiring honest online offers. Second, we address the test postured by delicate due date requirements through another strategy of minimized exponential-estimate LPs combined with double division prophets. Third, we create proficient social welfare estimation calculations utilizing the great primal-double system in view of both LP duals and Fenchel duals. Observational examinations driven by certifiable follows check the viability of our online closeout plan.

KEYWORDS: Auction/Barters, Cloud Computing, Web Procedures, Job Scheduling, Linear Programming Model, LP.

I. INTRODUCTION

Cloud computing is a web/internet – based manipulation strategy, which can be alluded to as the putting away and getting to of information over the web/internet as opposed to your PC's hard disk. This implies the information from either the PC's hard disk or over a devoted PC arrange. Cloud computing is put away at a remote place and is synchronized with other web/internet data. Cloud Storage framework is an administration show in which information are kept up, overseen and reinforcement remotely on the cloud side, and in the interim information keeps accessible to the clients over a system. Mobile Cloud Storage (MCS) indicates a group of progressively well known on-line benefits, and even goes about as the essential record stockpiling for the cell phones.

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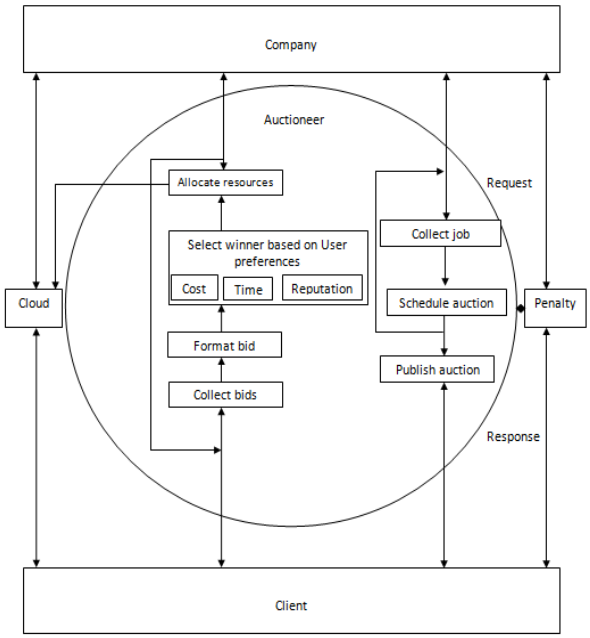

Fig.1 Proposed System Architecture

Considering a cloud data centre hosting a pool of K types of resource, including CPU, RAM and disk storage that can be dynamically assembled into different types of VMs. Let [X] denote the integer set {1,2,...,X}. There are a total c^k unit of type-k resource in this cloud. The cloud service provider acts as the auctioneer to lease VMs to cloud users through an auction. User's bid arrives randomly in a large time span 1,2,...,T. Note that multiple bids can arrive simultaneously, and would be ordered randomly. There are I users participating in the auction, and each user requests multiple types of VM, and specifies in its bid: (i) r^k_i , the total amount of type-k resource, and (ii) w_i, the number of slots required to finish the job by the designated VMs. Job execution doesn't need to be continuous. A user i's job can be executed at any time slot as long as the total execution time meets w_i before the deadline. Then consider two soft deadline models in this work: a basic model with alternative deadlines and a general model with penalty function and server operation cost.

II. PAST RESEARCH SUMMARY

Existing market mechanisms for cloud computing, particularly the auction type mechanisms, have been implicitly targeting the first type of non-elastic cloud jobs. In such one round and online cloud resource auctions, once a bid is accepted, the service time window of the corresponding VMs is fixed, i.e. either in the current round or between the start and finish times prescribed in the bid. Such auction algorithms do not need to consider the scheduling of accepted jobs. In sharp contrast, a well designed market mechanism for the second type of elastic jobs must pay close attention to not only whether to accept a bid, but when to schedule its execution based on its deadline information. For example, consider a cloud user who bids for a VM bundle tailored for human genome analysis. Its job can be processed within 3 hours if the specified VM bundle is provisioned; however, as long as the computing result is available within the next 24 hours, the user is happy.

This leaves ample space for job scheduling in the temporal domain, which a well-designed auction algorithm should judiciously exploit to maximize resource utilization and social efficiency for example, scheduling a job within its tolerance window to time slots with relatively low demand. The earliest VM auctions are simple in that they are one-round auctions, and assume that the cloud provisions a single type of VM, or that VM configurations are equivalent up to linear scaling. They also assume the scenario of static VM provisioning, where the number and type of VMs to be

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sold are predetermined prior to the auction start. Dynamic VM provisioning, in which the cloud provider makes decision on which VMs to assemble and how many based on demand learned from user bid during the auction, has been studied in the past two years.

Zhang et al. design a randomized auction for dynamic resource provisioning in cloud computing based on a convex decomposition technique, which is truthful and guarantees a small approximation ratio in social welfare. Shi et al. further study dynamic resource provisioning where cloud users are subject to budget constraints, and design online auctions where decision making is coupled in the time domain due to fixed user budgets. There have been recent studies on mechanism deign for batch jobs with deadlines. Lucier et al. study two scheduling algorithms for jobs with deadlines in cloud computing clusters. They analyze the competitive ratio for non committed scheduling, which does not require finishing executing a job that has started execution.

They do not provide any performance guarantee on the competitive ratio for committed scheduling. Navendu et al. design a truthful allocation and pricing mechanism for computing jobs with deadlines, but restrict attention to the offline setting. Construct online mechanisms for pre-emptive scheduling with deadlines. The mechanism is truthful and achieves a constant competitive ratio.

All of those works consider only one fixed deadline for each job, and fail to model the server's operation cost. In the existing a dynamic auction mechanism to solve the allocation problem of computation capacity in the environment of cloud computing. Truth-telling property holds when we apply a second-priced auction mechanism into the resource allocation problem. The cloud service provider (CSP) can assure reasonable profit and efficient allocation of its computation resources. In the cases that the number of users and resources are large enough, potential problems in second-priced auction mechanism, including the variation of revenue, will not be weighted seriously since the law of large number holds in this case. All of that work consider only one fixed deadline for each job, and fail to model the server's operation cost.

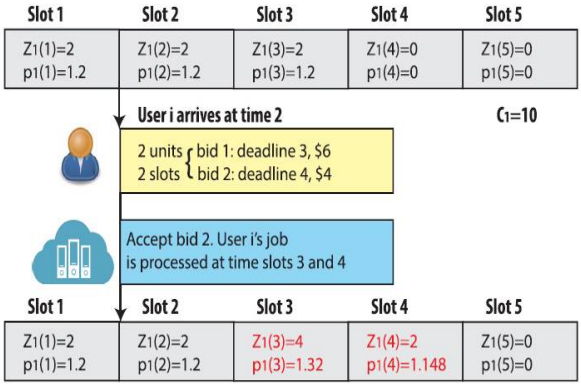

Fig.2 An Example of the process in $A_{online1}$

III. PROPOSED SYSTEM SUMMARY

The cloud market for computing jobs with completion deadlines, and designs efficient online auctions for cloud resource provisioning. A cloud user bids for future cloud resources to execute its job. Each bid includes: 1) a utility, reflecting the amount that the user is willing to pay for executing its job and 2) a soft deadline, specifying the preferred finish time of the job, as well as a penalty function that characterizes the cost of violating the deadline. Then target cloud job auctions that executes in an online fashion, runs in polynomial time, provides truthfulness guarantee, and achieves optimal social welfare for the cloud ecosystem. Towards these goals, it leverage the following classic and new auction design techniques. First, adapting the posted pricing auction framework for eliciting truthful online bids. Simultaneously target the following goals in our cloud auction design. First, require the cloud auction to be computationally efficient and executes in polynomial time. Second, the auction should be truthful, so that bidding true job valuation is the dominant strategy for a cloud user.

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Third, the auction should maximize the social welfare of everyone in the system including both the cloud provider and the cloud users. Such cloud auction design is faced with a number of challenges. First, truthfulness is a rather strong property that comes only with a pair of carefully prepared VM allocation and payment algorithms that work in concert with each other. Consider a basic setting where resources in the cloud are free of cost up to a known capacity limit, and that the soft deadline can be expressed by enumerating a few hard deadline options and their corresponding bidding prices. Then proceed to generalize our cloud auction design by addressing two practical concerns. First, we model the cost of resource provisioning in data centers, using a convex cost function that characterizes server cost with Dynamic Voltage Frequency Scaling. Second, we consider the general form of a soft deadline, specified by (i) a preferred deadline and (ii) a non-decreasing penalty function for deadline violation. The new social welfare maximization problem is an integer convex program. Resort to a new primal-dual solution framework for well-structured convex programs based on Fenchel dual, and adapted posted pricing auction framework from the previous scenario to this general setting.

IV. RELATED WORKS

In the year of 2018, the authors “Anjan Bandyopadhyay, Fatos Xhafa, and Sajal Mukhopadhyay” proposed a paper titled “An Auction Framework for DaaS in Cloud Computing” in that they described such as: Data as a Service (DaaS) is the next emerging technology in cloud computing research. Small clouds operating as a group may exploit the DaaS efficiently to perform substantial amount of work. In this paper an auction framework is studied when the small clouds are strategic in nature. We present the system model and formal definition of the problem. Several auction DaaS based mechanisms are proposed and their correctness and computational complexity analysed. To the best of our knowledge, this is the first and realistic attempt to study the DaaS paradigm in strategic setting.

In the year of 2018, the authors “Yixin Bao, Yanghua Peng, Chuan wu, Zongpeng Li” proposed a paper titled “Online Job Scheduling in Distributed Machine Learning Clusters” in that they described such as: Nowadays large-scale distributed machine learning systems have been deployed to support various analytics and intelligence services in IT firms. To train a large dataset and derive the prediction/inference model, e.g., a deep neural network, multiple workers are run in parallel to train partitions of the input dataset, and update shared model parameters. In a shared cluster handling multiple training jobs, a fundamental issue is how to efficiently schedule jobs and set the number of concurrent workers to run for each job, such that server resources are maximally utilized and model training can be completed in time. Targeting a distributed machine learning system using the parameter server framework, we design an online algorithm for scheduling the arriving jobs and deciding the adjusted numbers of concurrent workers and parameter servers for each job over its course, to maximize overall utility of all jobs, contingent on their completion times. Our online algorithm design utilizes a primal-dual framework coupled with efficient dual subroutines, achieving good long-term performance guarantees with polynomial time complexity. Practical effectiveness of the online algorithm is evaluated using trace-driven simulation and testbed experiments, which demonstrate its out performance as compared to commonly adopted scheduling algorithms in today's cloud systems.

In the year of 2014, the authors “Weijie Shi, Linquan Zhang, Chuan Wu, Zongpeng Li, Francis C. M. Lau” proposed a paper titled “An Online Auction Framework for Dynamic Resource Provisioning in Cloud Computing” in that they described such as: Auction mechanisms have recently attracted substantial attention as an efficient approach to pricing and resource allocation in cloud computing. This work, to the authors' knowledge, represents the first online combinatorial auction designed in the cloud computing paradigm, which is general and expressive enough to both (a) optimize system efficiency across the temporal domain instead of at an isolated time point, and (b) model dynamic provisioning of heterogeneous Virtual Machine (VM) types in practice. The final result is an online auction framework that is truthful, computationally efficient, and guarantees a competitive ratio value ~ < i > e </ i > + 1 over < i > e </ i > - 1 ~ 3.30 in social welfare in typical scenarios. The framework consists of three main steps: (1) a tailored primal-dual algorithm that decomposes the long-term optimization into a series of independent one-shot optimization problems, with an additive loss of 1 over < i > e </ i > - 1 in competitive ratio, (2) a randomized auction sub-framework that applies primal-dual optimization for translating a centralized co-operative social welfare approximation algorithm into an auction mechanism, retaining a similar approximation ratio while adding truthfulness, and (3) a primal-dual update plus dual fitting algorithm for approximating the one-shot optimization with a ratio & # 955; close to e. The efficacy of

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the online auction framework is validated through theoretical analysis and trace-driven simulation studies. We are also in the hope that the framework, as well as its three independent modules, can be instructive in auction design for other related problems.

In the year of 2014, the authors "Linquan Zhang, Zongpeng Li, Chuan Wu" proposed a paper titled "Dynamic resource provisioning in cloud computing: A randomized auction approach" in that they described such as: This work studies resource allocation in a cloud market through the auction of Virtual Machine (VM) instances. It generalizes the existing literature by introducing combinatorial auctions of heterogeneous VMs, and models dynamic VM provisioning. Social welfare maximization under dynamic resource provisioning is proven NP-hard, and modeled with a linear integer program. An efficient α-approximation algorithm is designed, with $\alpha \sim 2.72$ in typical scenarios. We then employ this algorithm as a building block for designing a randomized combinatorial auction that is computationally efficient, truthful in expectation, and guarantees the same social welfare approximation factor α. A key technique in the design is to utilize a pair of tailored primal and dual LPs for exploiting the underlying packing structure of the social welfare maximization problem, to decompose its fractional solution into a convex combination of integral solutions. Empirical studies driven by Google Cluster traces verify the efficacy of the randomized auction.

V. EXPERIMENTAL RESULTS

The following figure illustrates the graphical representation of the performance evaluation of auction process.

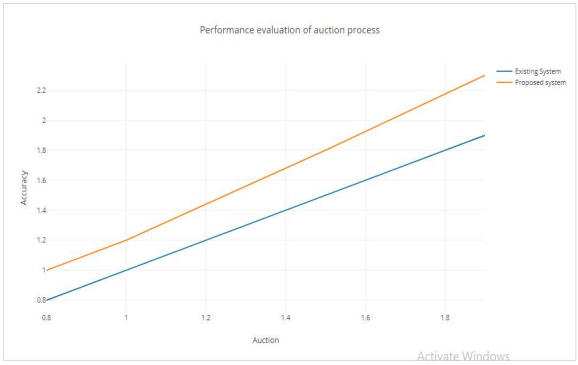

Fig2. Performance evaluation of auction process

VI. CONCLUSION

We examined the bartering outline for distributed computing employments that have delicate finish due dates. Our fundamental commitment is an online cloud work sell off that is honest and computationally effective, and accomplishes a decent focused proportion in social welfare. Methods utilized as a part of the bartering configuration incorporate the posted evaluating structure for honest online closeouts, another LP detailing and arrangement strategy for taking care of delicate due date imperatives, and in addition guess calculations in light of LP double and Fenchel double. Our technique for taking care of delicate due date imperatives might be appropriate to other closeout plan issues where due date is included, for instance, sought after reaction barters in a shrewd matrix.

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