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An Effective Bidding Approach for Resource Allocation in Cloud

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Abstract

Cloud computing is a model for enabling ubiquitous network access to a shared pool of configurable computing resources. These resources can be utilized by the customers at any time which are provided by the Cloud Service Providers (CSP). The users have to pay for the amount of resources needed or utilized i.e Pay as you go service. This can be done as on-demand instance or reservation which leads the customers to give more amounts for the resources. To avoid this problem the auction mechanism is applied. The Continuous Double Auction (CDA) is more efficient and more flexible and it is performed to improve the cost benefits of both customer and providers. The auction mechanism is performed on the e-bidding platform where both customers and providers can bids and asks for the price amount of the resources needed. But this may also leads to some problem when the particular provider does not have the efficiency to finish the work. The belief based hybrid strategy is described for the efficient allocation of computing resources. In this paper we introduce a concept called Feedback analyzer to calculate the Quality of Service (QOS). Using the various feedback of previous customers the QOS for storage, cost, efficiency and time will be calculated individually and then, based on the feedback the resources will be allocated to the particular CSPs.

Keywords: Cloud Computing, Cloud Service Providers, Continuous Double Auction, Feedback Analyzer, Quality Of Service.
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1. Introduction

The cloud computing has become an efficient one for computing of the resources. These resources are utilized by the customers and it is provided by the cloud service providers in the cloud environment. The resources may be any memory, storage, files, software and other essential documents. Many computing such as grid computing, green computing, cluster computing and cloud computing has been emerged. In these the cloud computing is an efficient model for utilizing of the resources when it is needed. Cloud computing and storage

solutions provide users and enterprises with various capabilities to store and process their data in third-party data centres. It relies on sharing of resources to achieve coherence and economies of scale, similar to a utility over a network. At the foundation of cloud computing is the broader concept of converged infrastructure and shared services.

Cloud computing, or in simpler shorthand just "the cloud", also focuses on maximizing the effectiveness of the shared resources. Cloud resources are usually not only shared by multiple users but are also dynamically reallocated per demand. This can work for allocating resources to users. For example, a cloud computer facility that serves European users during European business hours with a specific application (e.g., email) may reallocate the same resources to serve North American users during North America's business hours with a different application (e.g., a web server). This approach should maximize the use of computing power thus reducing environmental damage as well since less power, air conditioning, rack space, etc. are required for a variety of functions. With cloud computing, multiple users can access a single server to retrieve and update their data without purchasing licenses for different applications.

Users and providers have different requirements and objectives in an investment market. Users will pay the lowest price possible with certain guaranteed levels of service at a minimum and providers would follow the strategy of achieving the highest return on their investment. Designing an optimal market-based resource allocation that considers the benefits for both the users and providers is a fundamental criterion of resource management in distributed systems, especially in cloud computing services. Most of the current market-based resource allocation models are biased in favour of the provider over the buyer in an unregulated trading environment. In this study, the problem was addressed by proposing a new market model called the Combinatorial Double Auction Resource Allocation (CDARA), which is applicable in cloud computing environments. The CDARA was prototyped for simulating cloud computing environments, to evaluate its efficiency from an economic perspective. The results proved that the combinatorial double auction-based resource allocation model is an appropriate market-based model for cloud computing because it allows double-sided competition and bidding on an unrestricted number of items.

2. Related Works

The cloud computing utility services have created a competitive open market environment. Every market participant searches for its own path to the maximum profit, while a market pricing mechanism should be applied to balance supply and demand in Real-time and maintain the market reliability. Just like markets for network resources, the pricing problem has become increasingly urgent. It is clear that if the markets are not properly designed, they could function rather poorly, even leading to market failure. The traditional Internet was just a best-effort service without economic resources allocation, which resulted in poor network utility and congestion. Therefore many economic and technical approaches for network resources scheduling are brought, such as network utility maximization (NUM), network Resources auction, time-dependence pricing, etc. **[3].**

With the offer from cloud computing providers, scientists have the opportunity to utilize pay as-you-go resources together with their own and shared resources. However, scientists need to decide which parts of their applications should be executed in cloud computing systems in order to balance the trade-of between cost, time and resource requirements. There is a service for estimating, monitoring and analyzing costs associated with scientific applications in the cloud **[1].**

The objective of maximizing the long-term social surplus, which comprises of the aggregate utility of executed jobs minus load-dependent operating expenses. The social optimum may be induced by a *single* per-unit price, which charges a fixed amount per unit time and resource from all users **[5].** The network is a crucial resource in cloud computing, but in contrast to other resources such as CPU or memory, the network is currently shared in a best effort manner. However, sharing the Network in a data centre is more challenging than sharing the other resources. These can be done with several algorithms and mechanisms **[8].** The emergence of software agents that are capable of flexible, autonomous actions and interactions is changing online trading landscape **[9].**

In particular, one of the most significant applications of such agents is in the Continuous Double Auction (CDA), where multiple buyers and sellers compete with one another to buy and sell goods and services. Such CDAs are one of the most common forms of marketplaces and have emerged as the dominant financial institution for trading securities and financial instruments. Indeed, today, the major exchanges like the NASDAQ and the New York Stock Exchange (NYSE) and the major foreign exchanges (FX) use variants of the CDA institution **[10].**

3. A Cloud CDA Mechanism

In the cloud environment auction plays an important role in resource allocation. Auction is a sale in which the commodity is sold to the highest bidder. Cloud auction have three different areas and they are buyer, seller and an auctioneer. Virtualization technique helps to share single. Physical instance of an application or resource among different customers. Data will be in the form of virtualized pools in the data centre and these resources are allocated based on the needs of the customer. There are two types of auctions primary and secondary actions.

The cloud computing market structure consists of CSPs, cloud users and the uniform bidding platform. Therefore a complete competitive market can be formed. This section presents the solution to resource allocation in such a market, including the model of cloud CDA mechanism and its market rules. Then an e-bidding platform scheme is proposed to implement the mechanism in real cloud environment. Our cloud CDA mechanism is an efficient way of the decentralized allocation for computing resources.

Auction mechanisms are usually feasible to solve problems, and the CDA is more efficient and fair than single auctions in cloud markets. Cloud users often have a variety of application and valuation types, while CSPs also have various idle resources. The double auction mechanism allows both users and CSPs to submit their demands/commodities. Furthermore, the CDA mechanism permits buyers and sellers bidding simultaneously in one auction. By using this mechanism we can increase the profit of both users and customers.

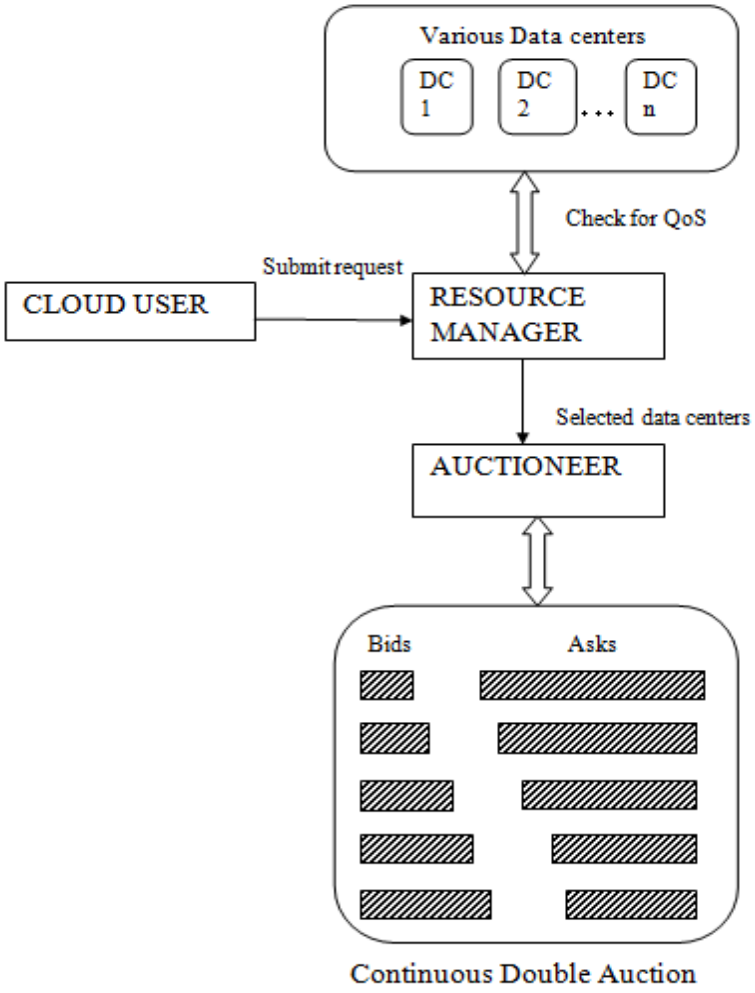

Fig 1. Action between the customer and CSP

3.1. Overview

Cloud Users will make request for resources and submit tasks to cloud server. Resource Manager will accept the requests of multiple Cloud Users. Resource Manager is connected to all the data centres in cloud so it will evaluate the requirements of Cloud User with all available data centres and select those data centres (and Hosts) whose priority is high and which meets the requirements of Cloud User.

Resource Manager will forward the selected data centres and Hosts to the Auctioneer. Auctioneer is connected to the entire data centre Brokers which act on behalf of respective data centres. Auctioneer will perform the auction between selected data centres and the Cloud User. Cloudlets or user tasks are executed in Hosts of data centre which wins the auction. Results of the executed tasks are transferred to Resource Manager. Then the Resource manager will send the results back to the Cloud Users.

3.2. Request Client

Request Client will reside on client side and it will handle the requests made by cloud clients. Then, it will check whether the requests made by the user adhere to decided SLA. If SLA is not violated, then the Request client would prepare a job description or requirement list and forward the request to cloud server through the network. It may also send some parameters which will describe the type of request, service required, type of application, criticality etc.

3.3. Resource Manager

Resource Manager is the middleware entity which will act as a mediator between the actual physical resources and incoming requests from multiple Request Clients. Resource Manager is implemented inside the cloud server. The type of resource manager to use depends on which cloud computing system is used and how it is implemented. The main tasks of resource manager are to manage, maintain and allocate all the resources available in cloud server. Resource Manager monitors the state of resources and provides statistical data to Auctioneer. Resource allocation/de-allocation is also carried out by the Resource Manager. When the task gets completed, results are sent back to Request Client and resources are released which can be reused for new requests.

3.4. Auctioneer

The Auctioneer is the entity which will govern the entire auction scheme. It gets the list of selected hosts from Resource Manager and performs auction between the selected hosts and Request Client. The data center which wins the auction will be chosen and hosts of that data centre will be assigned to cloud user for execution of tasks or cloudlets. Auctioneer will pass on the results to Resource Manager.

4. Belief Based Function

Most of the cloud users attempt to maximize their surpluses in cloud environment when the resources are utilized. This belief function works on behalf of the belief on the CSPs. The cloud users will assume that the selected CSP can finish their work when the bidding gets over. But some CSP will not have the enough requirements such as memory, applications.etc. In such cases the users work will not be finished or it will be finished partially. There are two types of stages such as aggressive stage and the unaggressive stage. In the aggressive stage the CSP should compute a best ask based on the improved belief function and in unaggressive stage the user or CSP will submits new bids or asks that means it will accept a worse price than the previous users done. So this belief function will be applicable to only some cases where the users have less amount of work.

5. Feedback Process

In this paper, we present a fresh way to automatically mine similar entities from relative reviews that users posted online to address this difficulty. To achieve high accuracy and high recall, a weakly supervised approach is

developed for comparative reviews identification and comparable entity extraction by control a large collection of online feedback archive. The resource providers is located by the directory node that have the required reputation, available amount, and price that it needs to choose the provider(s) for the resource requester. The final QoS offered by a provider is determined by a number of quality factors such as efficiency, distance, trustworthiness, security and price. We call these factors as QoS demands. When choosing from a number of providers, a single QoS demand at a time is rigidly considered by the most previous approaches. However, different tasks of users have different requirements. For time-critical jobs, distance should be given most priority.

The transaction prices in CDA is expected to be converge towards the competitive equilibrium price p*. To calculate this market efficiency and the efficiency of bidding strategies are used. At equilibrium condition both will be equal. The daily price volatility α, is used to define how the transaction prices in CDA converges towards the equilibrium price p*. The α can be calculated by using the formula,

$$\alpha = \frac{1}{p^*}\sqrt{\frac{\sum_{i=1}^{N}(p_i - p^*)^2}{N}}$$

As the cloud computing is a competitive market the p* is decided by both supply and demand together.The market efficiency can be calculated by using the formula,

$$e_{market} = \left(\frac{\sum_i (S_{b,i}/\eta_b)}{\sum_i S_{b,i}^{MP}} + \frac{\sum_j (S_{s,j}/\eta_s)}{\sum_j S_{s,j}^{MP}}\right)/2$$

After finding the market efficiency the bidding efficiency is compared with it. The daily price volatility α can also be calculated with the help of the transaction prices of final trade in Marshallian path as, Peer Trust computes the trustworthiness of an agent as normalized feedback weighted against the credibility of feedback originators.

$$\alpha = \frac{1}{p^{MP}}\sqrt{\frac{\sum_{i=1}^{N}(p_i - p^{MP})^2}{N}}$$

Peer Trust uses personalized similarity measure to compute the credibility of recommenders and it uses this credibility measure to weight each feedback submitted by the recommenders. Fig 2. Cloud CDA with QOS FC Trust uses transaction density and similarity measure to define the credibility of any recommender providing feedback as opposed to which use global trust to weigh the quality of feedbacks. In other words, FC Trust differentiates from that of providing services with the role of providing feedbacks. By using this the customer feedback process will be computerized and automatic feedback analyzing takes place. By using this, the Customer Feedback process is computerized and automatic feedback analyzing takes place. The customer can select the provider based on the trust worthiness. When the process takes place in this manner, the efficiency, openness, fairness and feasibility gets increased.

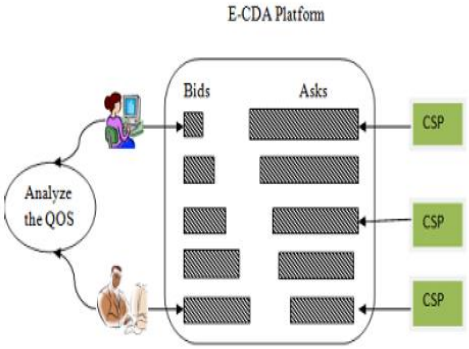

Fig 2. Cloud CDA with QOS

On comparing the above given graphs the cloud CDA with QOS attains the more customer satisfaction than the cloud CDA. Because before allocating the resources the users will check for the QOS of the CSPs. If that particular CSP has not finished the work properly in the previous jobs then that CSP will not selected by most of the users. They will go for other CSP who has the best rating in the QOS, so that their works will be finished properly and the user will get more satisfied.

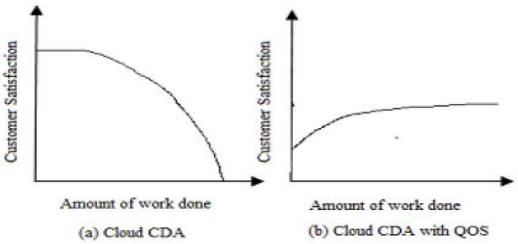

Fig 3. Comparing cloud CDA and cloud CDA with QOS

6. Conclusion

Cloud computing has been an emerging technology which allows the customers to use the resources based on their needs. The cloud computing utility services have created a competitive open market environment. Every market participant searches for its own path to the maximum profit, while a market pricing mechanism should be applied to balance supply and demand in Real time and maintain the market reliability. For such environment the CDA mechanism will be an effective one for utilizing of the resources.

In this paper, along with the CDA mechanism the QOS is also included to make the process more effective. The customer can select the CSP based on the trust worthiness. The QOS for the cost, performance and storage of the CSPs are evaluated individually. Based on that feedback the user will starts bidding with the best CSP. When the bidding achieves the equilibrium with the CSPs asks then the bidding will takes place in the e-bidding platform and the users work will be finished soon. This can also be applied in real cloud markets to attain its feasibility.

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