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AUCTION BASED RESOURCE ALLOCATION IN FEDERATED CLOUD ENVIRONMENT TARA

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ABSTRACT

The growing market of cloud computing resulted in increased demand for cloud resources and it will become difficult forindividual service providers (SPs) to fulfill all resource requests. That leads to a situation where two or more SPs may form a group(federation) and share the resources in order to fulfill the cloud users' demand and gain economic advantage. Now, due to theformation of more than one federations by different cloud providers, it may be difficult for users to select a suitable federation who candeliver cloud services at a fair price. In this context, it is necessary to have a framework that will efficiently allocate resources of cloudfederations to the users at a fair price and stop market manipulation. In this paper, we propose a multi-unit double auction mechanismcalled TARA (Truthful Double Auction for Resource Allocation) that can be used to efficiently choose cloud federations for users fromwhich they can get resources. Here, we consider a multi-seller and multi-buyer double auction mechanism for heterogeneousresources, where every buyer submits their bids and every seller places their ask (the price of a resource that is offered by afederation). TARA achieves some important properties like truthfulness (also known as incentive compatibility), individual rationalityand budget balance for both buyers and sellers. TARA is also computationally efficient and posses

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high system efficiency. Thesimulation results also show that total utility of buyer is more than some existing double auction mechanisms.

1.INTRODUCTION

Group of service providers (SPs) collaborate to share their computing resources with peers to gain some benefits in terms of profit and Quality of Service (QoS) [1] [2] [3]. Cloud federation enables SPs to handle unprecedented resource (virtual machine) demands without having to build new points-of-presence and eventually able to maintain committed QoS in terms of scalability and availability. It also enables SPs to make some extra revenue by sharing their idle or underutilized computing resources with peers during the time of low resource demand. Additionally, a federation also make it possible for overloaded SPs to distribute their load among other member SPs of that federation. Previously in [2] [3] [4], we have focused on the problem of cloud federation formation. But, in this work we have addressed the problem of resource allocation in federated cloud environment.

In cloud federation number of service providers collaborate together to avail the benefits provided by the federation. Now, let us consider the scenario, when there are more than one federations having different pricing models in the federated cloud environment, it may be difficult for users to select a suitable federation who can deliver cloud services at a fair price [5]. Hence, we should have a fair resource allocation mechanism that will efficiently allocate resources of cloud federations for users' resource requests without any market manipulation. Intuitively, we can say that resources should be allocated to those users who value them the most. In economics, auction theory [6] is a well researched field and has been applied to other domains. One of the important applications of auction theory is: it can be used as a method for efficiently allocate resources to those users who value them the most and to stop market manipulation. Hence, in this paper an auction mechanism is used to solve the problem of resource allocation in federated cloud

environment. We propose a multi-unit double auction called TARA (Truthful Double Auction for Resource Allocation) that can be used to efficiently choose cloud federations for users from which they can get resources.

Please note, we have preferred to use double auction over a single sided auction. This is because, a single side auction can either be sell-side or the buy-side. In a sell-side auction commodities are distributed from a single seller to more than one buyer. On the other hand, in a buy-side auction, a buyer receives asks (offer prices from sellers) from more than one seller and selects a winner from whom the buyer will buy the commodity [7]. What if we have more than one seller and also more than one buyer? Well, we just merge together a buy-side and a sell-side auction to develop a two-sided auction mechanism which is also known as a double auction. In other words, double auction is an auction in which both buyers and sellers are involved actively. Our scenario perfectly matches with a double auction. It is because we have more than one seller (cloud federation) and more than one buyer (cloud user). Hence, double auction provides the platform to both the cloud federations and the cloud users such that, they can involve in trade simultaneously. In this paper, the terms sellers and buyers are used interchangeably with the terms cloud federations and cloud users respectively.

Auction can be used to efficiently allocate resources of sellers to buyers in a market. Here we consider a market of cloud federations' resource allocation, in which cloud federations offer resources to cloud users. In this paper, we model the cloud resource allocation as a double auction, where our auction mechanism finds a mapping between a set of cloud federations and the users. If a federation is mapped to a user then it means that the federation can deliver services to that user. The double auction model proposed in this paper is a multi-unit double auction for heterogeneous resources.

However, designing an auction mechanism for allocating resources of

cloud federations to the users is expected to hold certain properties, such as:

Truthfulness: A given auction mechanism will be truthful if disclosing the private valuation truthfully is always the dominant strategy for sellers and buyers participating in the auction to get an optimal utility, no matter what strategies other participants (buyers and sellers) are using.

Computational efficiency: The computational efficiency property of an auction says that the auction outcome (allocation of resources and calculation of clearing price and payment be computed in polynomial time.

Budget balance: Budget balance says that all monetary transfers must be done between cloud users and the cloud federations, and the auctioneer or broker (a trust worthy third party who supervise the auction) should not lose or gain money.

Individual rationality: Individual rationality says a cloud federation is always paid more than its ask (the price of a resource that is offered by a federation) and a cloud user always pays less than its bid (the price at which an user is
willing to buy a resource).

2.1 LITERATURE SURVEY

The increasing complexity and demand for computational resources have led to the development of federated cloud environments, where multiple cloud service providers (CSPs) collaborate to offer a diverse and robust computing infrastructure.Within these federated environments, efficient resource allocation becomes critical to maximizing resource utilization and meeting the diverse needs of users. Auction-based resource allocation mechanisms have emerged as a promising solution due to their potential to dynamically and efficiently allocate resources based on demand and supply.Federated cloud environments integrate resources from various

CSPs to create a unified cloud infrastructure. This integration offers several advantages, including enhanced resource availability, improved fault tolerance, and the ability to meet a wide range of user requirements.However, it also introduces challenges related to resource heterogeneity, dynamic user demands, and inter-provider coordination. Effective resource allocation mechanisms are essential to address these challenges and ensure optimal performance.Auction -based mechanisms leverage economic principles to allocate resources efficiently.

In these mechanisms, users (or agents acting on their behalf) bid for resources, and the allocation is determined based on the bids and the available resources. Several auction models are applicable in federated cloud environments, each with distinct characteristics and advantages .Auction-based resource allocation mechanisms offer a promising approach to managing resources in federated cloud environments. By leveraging economic incentives and market-based principles, these mechanisms can enhance resource utilization, reduce costs, and improve overall system performance. Future research in this area should focus on developing more sophisticated auction algorithms, addressing scalability issues, and ensuring robust security and fairness in the bidding process. As federated cloud environments continue to evolve, auction-based mechanisms will play a crucial role in enabling efficient and dynamic resource management

3. EXISTING SYSTEM

In [10], Rochwerger et al. present the primary requirements for forming federations among cloud SPs. In order to support these requirements Rochwerger et al. in [11] introducing the Reservoir model whose main aim is to find the technology required

to overcome the problem of scalability faced by any individual service providers. Further, they have introduce the model in which more than one SPs collaborate together to provide services as a federated cloud. Goiri et al. [12] modelled cloud federation as a means for a SP to dynamically increased their computing capacity by collaborating with other SPs when demands are high and rent out unused computing resources to other SPs when the demands are low. They introduced several equations to help SPs to decide when to outsource resources to extraneous SPs, insource (rent out) free resources to other SPs and shut down unused physical machines to save power. Celesti et al. [13] presents a system named Cross-Cloud Federation Manager which allows a SPs to form a federation with other SPs based on three phase model consisting of discovery, match-making and authentication. Their model considers home cloud and foreign cloud. Where home clouds, when fall short of computing resource capacity and unable to fulfill users' requests, outsource the requests to the foreign clouds.

In [1], Mashayekhy et al. formulated cloud federation formation based on hedonic coalitional game. The main objective of their work is to maximize the profit of the formed federation. Moreover, Wahab et al [17] have also provided the solution for cloud federation formation based on Hedonic coalitional game. But the main objective of their work is to minimize the maliciousness between service providers within federation.

In [14], Kumar et al provide a systematic and detailed study of double auction techniques for cloud market. Kumar et al [15] also design a combinatorial double auction called TCMDAC for cloud market. In [16], Farajian et al propose a market-driven continuous double auction method (MCDA) for efficient cloud service allocation. Two widely known double auction mechanisms in economics literature are, Vickrey-Clarke-Groves (VCG) [18] [19] [20] and McAfee [8] double auction mechanism. The VCG double auction mechanism can satisfy truthfulness property [9]. Also, it can be shown that VCG double auction can achieve individual rationality property [21]. The other double auction

mechanism, McAfee can achieve three desired properties- individual rationality, budget balance, and incentive compatibility (truthfulness).

2.3.1 DISADVANTAGES

The security is very less since an existing system is not implemented multi-unit double auction called TARA (Truthful Double Auction for Resource Allocation).

In an existing system, an existing system is not implemented model the cloud resource allocation as a double auction, where our auction mechanism finds a mapping between a set of cloud federations and the users.

4. PROPOSED SYSTEM

Here, in our proposed double auction mechanism TARA, cloud users and cloud federations place their bids and asks to an auctioneer which is an trust worthy third party. The auctioneer manages and controls the auction process, like deciding theallocation of resources and determining the clearing price (also known as hammer price) and payment. Here, clearing price is the price charged to a buyer for using resources of the sellers and payment is the price given to the seller for providing the service. TARA works as follows: The auctioneer gathers asks and bids from the cloud federations and the cloud users respectively. Then, the auctioneer finds a mapping between those asks and bids by allocating auction

commodities from the cloud federations to the cloud users, as well as payments from the cloud users to the cloud federations accordingly. The key contributions of this work are as follows:

We model the resource allocation problem of cloud federation as a double auction.

TARA provides an auction mechanism which is proved to be truthful, individually rational and budget balanced.

The simulation results shows that, TARA achieves high system efficiency compared to some of the existing double auction mechanisms.

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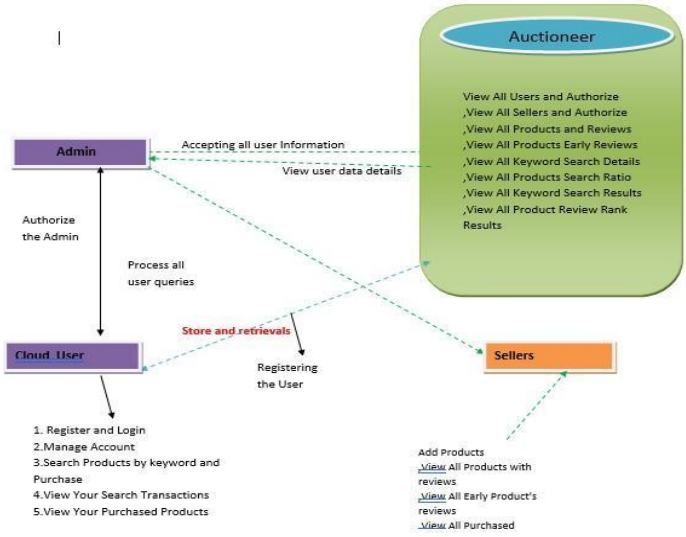
each iteration, the algorithms are chosen as the most important features. To assess the probability of ranking features, the new model that includes the most essential predictors is retained until all are exhausted.

ADVANTAGES

- The proposed is implemented truthful double auction based resources allocation mechanism which is more effective.
- In the proposed system, the system proposes a multi-unit double auction mechanism called TARA (Truthful Double Auction for Resource Allocation) that can be used to efficiently choose cloud federations for users from which they can get resource.

5SYSTEM ARCHITECTURE



6.MODULES INVOLVED

MODULES SERVICES

➢ AUCTIONEER

In this module, the **Auctioneer** has to login by using valid user name and password. After login successful he can do some operations such as View All Users and Authorize,View All E-Commerce Website and Authorize,View All Products and Reviews,View All Products Early Reviews,View All Keyword Search Details,View All Products Search Ratio,View All Keyword Search Results,View All Product Review Rank Results

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- **VIEW AND AUTHORIZE USERS**

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

- **VIEW AND CHERT RESULT**

View All Products Search Ratio,View All Keyword Search Results,View All Product Review Rank Results

- **SELLER**

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by using authorized user name and password. Once Login is successful user will do some operations like Add Products,View All Products with reviews,View All Early Product's reviews,View All Purchased Transactions.

- **CLOUD USER**

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by using authorized user name and password.

Once Login is successful user will do some operations like Manage Account, Search Products by keyword and Purchase, View Your Search Transactions, View Your Purchased Products**7. OUTPUTSCREENS**

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AUCTIONEER:

CLOUD USER

SELLER

8. CONCLUSION

In this paper, we focus on a truthful double auction for resource allocation which map the resources of winning federations to the winning cloud users. TARA can effectively allocate the cloud federations resources among the users to satisfy their demands, while maintaining the desirable properties (computational efficiency, individual rationality, budget balance, and truthfulness) for both buyers and sellers. We have provided rigorous proof on these properties of TARA and confirmed the analysis with extensive simulation results.

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