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PRICING ADJUSTMENT COMBINATORIAL DOUBLE AUCTION RESOURCE ALLOCATION MODEL IN CLOUD COMPUTING

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ABSTRACT

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 and simulated using CloudSim, a Java-based simulator 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.

Keywords- double auction, cloud computing, resource allocation

INTRODUCTION

Cloud computing is an advanced technology in which it uses high speed internet-based computing by which user can access their resource from the remote site .It is based on sharing on resources through virtualization. Cloud computing emerged in early 1996 but it become popular when Amazon developed Elastic Compute Cloud in 2006. Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility over a network. Cloud computing is the result of evolution and adoption of existing technologies and paradigms.

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 center and these resources are allocated based on the needs of the customer. There are two types of auctions primary and secondary actions. The following figure illustrates it. The goal of cloud computing is to allow users to take benefit from all of these technologies, without the need for deep knowledge about or expertise with each one of them.

This paper is organized as follows section II Related Works, section III Proposed Architecture section IV Algorithm Description section V Result Analysis section VI conclusion

RELATED WORKS

ParniaSamimi (2013) suggested that 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. Most of the current market-based resource allocation models are biased in favor of the provider over the buyer in

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an unregulated trading environment. Rahul Jain (2006) proposed a multilateral trading problem with multiple indivisible goods and independent private types in which ex post budget-balance is required. The problem is partly motivated by the need to design mechanisms for efficient resource allocation exchange between strategic internet service providers. Since in an auction, players usually have incomplete information.

XingweiWang (2013) proposed a tackle this issue by introducing microeconomic methods into the resource management and allocation in the cloud environment. With the combination of batch matching and reverse auction, a reverse batch matching auction mechanism is proposed for resource allocation. On that basis, we further introduce the strategy of twice punishment and the pursuit of QoS (Quality of Service) for the purpose of trading fraud prevention. The winner of the auction is then determined by solving an optimization problem that maximizes a weighted sum of three evaluation criteria, i.e., the market efficiency, user satisfaction and QoS.

StefaniaCostache (2012**)** proposed Themis, a system that uses an economic-based approach to automatically allocate resources to the applications that need them the most. Themis provides generic scaling policies based on feedback control loops. Themis can effectively meet application performance objectives while optimizing infrastructure's utilization. Shin-ichi Kuribayashi (2013) proposes to enhance the existing joint multiple resource allocation method, so that it can handle multiple heterogeneous resource-attributes. It can reduce the total amount of resources up to 30%.Ching-Hsien Hsu(2014) presented an energy-aware task consolidation (ETC) technique that minimizes energy consumption. ETC achieves this by restricting CPU use below a specified peak threshold. The simulation results show that ETC can significantly reduce power consumption in a cloud system, with 17% improvement over MaxUtil.

Marian Mihailescu (2010) proposes a dynamic pricing mechanism for the allocation of shared resources, and evaluates its performance. In the work the author formally prove the economic properties of our pricing scheme using the mechanism design framework.

VIRTUAL MACHINE RESOURCE ALLOCATION

Virtualization is critical to cloud computing because it simplifies the delivery of services by providing a platform for optimizing complex IT resources in a scalable manner, which is makes cloud computing cost effective. Virtualization technology to allocate data center resources dynamically based on application demands. Virtual machine resource Allocation is the process of assigning available resources to the needed cloud applications over the internet. Resource allocation starves services if the allocation is not managed precisely.

COMBINATORIAL DOUBLE AUCTION

An auction is a process of buying and selling of commodities by providing a bid and then selling the item to the highest bidder .It is used in cloud and grid environment. It can be closed or open. Auction can be classified as single side auction and double side auction. In a double auction, both buyers and sellers select bids. Most often, these auctions are continuous. 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, which causes it to be economically efficient.

FLOWCHART

In existing combinatorial auction-based mechanism for dynamic provisioning and allocation of VM instances in clouds is used [2]. The problem defined in this method is that providers are not maximized their revenue by attracting users and improving the resource utilization. However, it is hard for users to determine which providers that they should trade with, and vice versa, to meet their objectives under dynamic and unpredictable resource demands, supplies, prices, and budgets. So we use grouping auction for improving the revenue for users and to improve the resource utilization in cloud auction environment To Adjust the price between cloud user and provider using combinatorial double auction model (CDA).

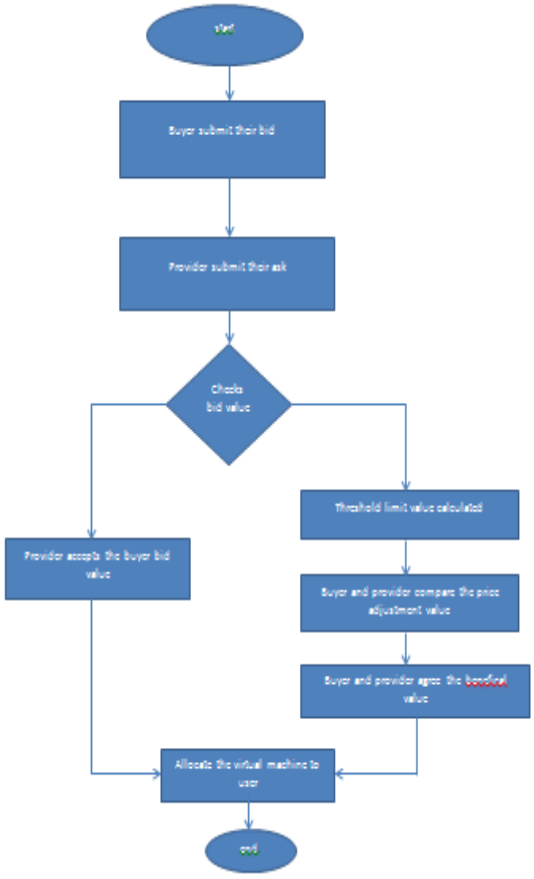

Fig.1 flowchart

The present work which results in the improvement of revenue generation respectively. The present work proposes auction system in the cloud instance market, and the simulation studies have verified its applicability and effectiveness in terms of resource efficiency and monetary benefits to a participant. The proposed system outperforms existing cloud service. And the architecture for the proposed system is more efficient for resource utilization and the profit for the providers and users. In particular, combinatorial Double auction-based mechanisms are best suited for resource allocation in clouds because of the nature of the allocation requests. However, we have to overcome certain challenges while using combinatorial auction-based mechanisms.

ALGORITHM DESCRIPTION

1. Input the buyer submit their and the same time provider submit their ask.
2. Auctioneer announces start of the auction to the participants of the auction.
3. Brokers and cloud providers send their bids to the auctioneer.
4. Winner determination using pricing adjustment algorithm.
5. buyer and provider agree the beneficial value and allocated the virtual machine
6. Price adjustment will be calculated.

PRICING ADJUSTMENT METHOD

Implementation includes all those activities that take place to convert from the old system to proposed system. The old system is operated in different manner from the new system. A proper implementation is essential to provide to meet requirements.

Implementation is a stage of the project when the theoretical design is turned into working system. If the implementation stage is not properly planned and installed, it can cause chaos. Thus it can be considered the most crucial stage in achieving a successful new system and in giving the user confidence that the new system will work and be effective.

CloudSim is used as simulation framework along with NetBeans IDE. CloudSim is a new, generalized and extensible framework. It allows seamless modelling, simulation and experimentation of cloud computing infrastructures and application services. CloudSim can be used to test the performance of newly developed application services in a controlled and easy to set up environment. The main advantages of CloudSim are time effectiveness, it requires very less time and effort to implement Cloud based application provisioning test environment. Flexibility and applicability, developers can model and test the performance of their application services in heterogeneous cloud environments.

WINNER DETERMINATION

Auctioneer is responsible for determining the winners in an auction. Auctioneer first sorts requests and offers of users and cloud providers in the increasing order of their attributes. To determine the winners, the users and cloud providers lists had to be sorted. The reason for sorting is to prioritize the requests from users, whose bid amounts were higher, and to those cloud providers who offered cheaper amounts.

Pricing adjustment is used to decide a payable price by a user for an allocation. The final trade price from users to cloud providers was the sum of the price adjustment then adjusts the price using the threshold limit value

Pricing adjustment algorithm (buyer, provider, bid value)

Step 1: {phase 1:
collect bids}

Step 2: for
j=1….n do

Step 3: collect bid Bj= (r1….rm,vj) from user Uj

Step 4: {phase 2: submit ask to provider}

Step 5: VM instances characteristics W= (W1….Wm) (type1, type2, type3)

Step 6: for j=1…n do

if for i=1,…m UjTi

if threshold value(D)<Uj bid value allocate the VM instances to Uj

Else

$$\text{Compute price} = \frac{\text{incoming user}}{200} * \text{Average Of History ()}$$

K// where k is a no of users

Step 7: if Uj compute price<Uj bid price allocate the VM instances to Uj

Step 8: end for

Average of History ()

{

for j = 1,…,n do

sum = sum + THj

Avg = sum/n

return avg;

}

RESULT ANALYSIS

We investigate the performance of the new mechanisms. In terms of resource generation, profit and number of users served. Discount is provided to the group based on the number of users in each group the performance can be shown. This section investigates the adjustment of pricing between user and provider by using our pricing adjustment algorithm the revenue generation of the user would become higher and benefit. The metrics calculated are

- Resource utilization
- Revenue generation

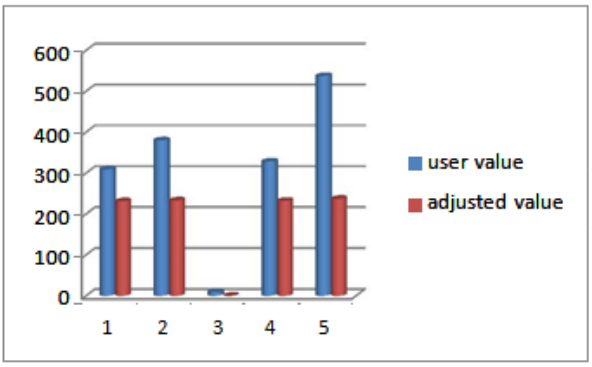

Fig 2: Performance of revenue generation

RESOURCE UTILIZATION

The resource utilization defined as the percentage of the adjustment price a resource is busy executing jobs. In order for the resources to be efficiently used, the user level should increases.

REVENUE GENERATION

The provider value adjusted by using our pricing adjustment algorithm and the number of users increase more. When the number of user increases revenue generation will became higher for the users

CONCLUSION

The present work proposes combinatorial double auction in the cloud instance market, and the simulation studies have verified its applicability and effectiveness in terms of resource efficiency and monetary benefits to auction participants. The proposed system outperforms existing cloud service. And the flowchart for the proposed system is more efficient for revenue generation.

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