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Dynamic Pricing for Usage of Cloud Resource

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ABSTRACT: The Cloud resource procurement of cloud resources is an interesting and yet unexplored area in cloud computing. cloud vendors choose a fixed pricing strategy for pricing their resources and do not provide any incentive to their users. That's why to choose only automates the selection of an appropriate cloud vendor and also to implement the dynamic pricing. A cloud broker which can implement the procurement module enables users to automate the choice of cloud vendor among with different offerings and also to implementing the dynamic pricing in the cloud.

KEYWORDS: Cloud Computing, Mechanism design, cloud broker, resource procurement, reverse auctions, dynamic pricing.

I. INTRODUCTION

Many companies like Amazon, IBM, Google, Salesforce.com, Unisys, and so on, now offer cloud services. The main advantage of cloud computing is the ability to provision IT resources on demand. The resources offered may include storage, CPU processing power, IT services, and so on. A cloud user is a person or an organization that offers cloud services for use on payment. A cloud broker is a middleware that intermediate between the user and service providers.

Cloud vendors follow a fixed pricing method for pricing their resources and do not provide any incentive to their users to adjust consumption patterns. A user who wants to use a service in the form of an application hosted on a cloud. There are cloud vendors who provide the varying quality-of-service parameters at different prices. The user has to select the appropriate one with in the budget. This selection is complex and challenging one because the companies offering cloud services changes continually. So it is very difficult to select the appropriate one manually. Because the user has does not about knowledge of best services. So there is a need for scalable and automated method to perform the resource procurement in the cloud.

II. RELATED WORK

In [2] authors used to change management approach cloud backed business process models. It has more efficient to changes in a cloud supported business process model. It has used to handle the agility of a process using cloud services. The cloud broker has supported the business process. The existing service offering from the marketplace, which are used in the current cloud instantiation. The current relations between the business processes and the cloud services. The cloud broker manages a repository of all providers and services which are relevant to the value chain of a company. This allows the Cloud Broker to change the cloud configuration when necessary. We are currently working on a framework/language to describe the different cloud services. In [3] Cloud computing is a model for enabling resource allocation to dynamic business workloads in a real time. This approach could be moved to a public cloud environment from a private data center. It has based on the price model for hosting workloads on a pay-per-use basis. In [4] authors introduce a federated cloud that would consist of several cloud providers joined by mutual collaboration agreements. It could share their infrastructure with members in need of additional resources. In [5] which virtualized resources provide reliable and guarantee service for users demand. These applications reaches geographically separated storage or data resource with even cross-continental-networks. Then, the performance degradation of networks will surely affect the cloud application performance and user request. To ensure guarantee service of bulk data transfer in cloud computing, the reservation and combined resources utilization become critical issues which include data and network resources. User's Quality of Service constraint dynamic resource selection algorithm has been implemented for optimization of combined resources allocation. In [6] model where a business acts on behalf of consumers of one or more cloud services to intermediate and add value to the service being consumed.

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Providers of cloud services can benefit as well through establishment of an ecosystem of partners, such as brokerages, who enhance the provider's service and draw customers to it. In [10] authors Dynamic pricing is the dynamic adjustment of prices to consumers. It depends on the value these customers attribute to a product or service. Fixed pricing paradigm is giving way to a dynamic pricing paradigm in e-business markets and that dynamic pricing strategies, when properly used, outperform fixed pricing strategies. The role of reinforcement learning based approaches for dynamic pricing and discussed a single seller example with nonlinear pricing used for different quantities.

III. CLOUD MECHANISM AND DESIGN

Cloud Resource procurement Model:

In this model to implement system wide solutions to problems that involve multiple self interested agents, given private information about their preferences. It can also be viewed as the design of a framework of protocols that would foster particular ways of interaction among agents with known behavioral characteristics, to bring about a globally desirable outcome. The goal of mechanism design is to design social choice and payment functions. to solve sponsored search auctions and resource procurement in grid computing. They design three mechanisms for procuring resources in Grid. The mechanisms presented are incentive compatible and optimal. They also design incentive compatible broadcast protocols for ad hoc networks. Cloud vendors are represented by N = {1, 2 . . . n}. In this procurement auction, each cloud vendor responds by bidding with total cost c_i and promised QoS parameters. These parameters are converted into numbers q_i using the technique presented in the previous section. Hence, the bid is an ordered pair (c_i , q_i)

System Model:

It is based on game theory, we assume that players are rational and have common knowledge and private information. Rationality implies that goal is to maximize payoff. In our model, cloud vendors are rational. Hence, cloud vendors are risk neutral. Each cloud user has resource requirements. The users perform reverse auctions for procuring resources which are also called procurement auctions. Cloud vendors offer resources, but with varying costs and quality metrics. The goal of the cloud user is to minimize the total cost of procuring resources without compromising quality of service. To minimize the procurement cost, it is necessary for the cloud user to know the real costs of cloud vendors. A user announces its specifications for desired resources and quality of service to all cloud vendors, with the broker acting as a middleman. The cloud vendors decide whether to participate in the auction based on the user information and submit their bids to the broker. The broker aggregates the bidding information and selects the appropriate cloud vendor. Cloud vendors are rational and intelligent. Hence, one of them might bid with a false valuation to maximize its utility. The goal of providing incentives is to encourage truthful bidding.

IV. PROPOSED ALGORITHM

A. *Cloud-Optimal Mechanism:*

The C-Dominant Strategy Incentive Compatible mechanism is not budget balanced. On the other hand, even though the C-Bayesian Strategy Incentive Compatible mechanism is budget balanced, it is not individually rational. The C-OPT mechanism to address the limitations of both the C-DSIC and C-BIC mechanisms. If a mechanism is Bayesian incentive compatible and individually rational, then the mechanism is optimal. Reverse auction can be applied only to single items with unit demand.

In this model, both cost and Quality of Service are correlated. Hence, the design of an optimal auction is not trivial. In propose an optimal mechanism for procurement auctions for suppliers who have finite production capacity. Hence, assume that cloud vendors have finite Quality of Service. It is an important work with respect to building an optimal mechanism. Prove a set of theorems to prove a mechanism as optimal. In these theorems and prove that C-OPT mechanism is optimal.

B. *Description of the Proposed Algorithm:*

The C-OPT mechanism with allocation rule and payment rule is Bayesian incentive compatible, individually rational and revenue maximizing. C-OPT is an optimal mechanism and is more general compared to both C-DSIC and

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C-BIC. Assume that cloud vendors are symmetric in C-DSIC and C-BIC. But in realistic scenarios, different cloud vendors may have different price distributions. On the other hand, C-OPT can be applied when φ_1, φ_2 ... $\varphi_{n.}$

C-OPT reduce to C-DSIC under the following conditions:

- Cloud vendors are symmetric.
- The joint distribution function is regular.

C-DSIC is prone to bidder collusion and is not budget balanced. In C-BIC, losing cloud vendors lose their money. In C-OPT, the cloud vendor can neither overbid nor underbid. If the cloud vendor overbids, then incentive is not paid. On the other hand, if it underbids, then it will not be the winner. C-OPT are suitable in a larger set of real-world contexts than C-DSIC and C-BIC. The mechanisms presented in this paper have linear time complexity. They are appropriate for implementing procurement auctions.

V. PSEUDO CODE

Step 1: Generate the input values on set of bids b_1, b_2...., b_n.
Step 2: Output values in the winner and payments for participants (h_1, h2...., hn).
Step 3: Calculate the minimum bid of value.
Step 4: Check the below condition for each bidding.

```
For I ← 1 to n do
Compute Hi;
If (Hi<min) then min ←Hi;
Winner ←I;
End
For i←1 to n do
```

$H_i(b_i) \leftarrow c_i g_i(b) + \int_{ci}^{c} Xi(y, qi)dy$

Step 5: Select the winner on the basis of minimum bid value.
Step 6: Each cloud vendor I can be calculated.
Step 7: End.

VI. EVALUTION RESULTS

In this procurement mechanisms that can be used by grid users to procure resources in a computational Grid with rational resource providers. They simulate the proposed mechanisms and compare the procurement costs fig 1 and 2 of the mechanisms.

The following approach is adopted by them to evaluate their proposed mechanisms.

- The mechanisms proposed are decentralized in nature. To determine the lower bound on the procurement cost, they use a naive centralized algorithm. It can be centralized algorithm sorts the bids in the ascending order and allocate jobs according to the order. This algorithm assumes that resource providers are nonstrategic.
- They do not use a standard grid toolkit because their goal is to evaluate mechanisms and not to simulate low-level grid tasks. They build a customized simulation environment with an appropriate level of abstraction.
- Costs and tasks are uniformly distributed. The Procurement cost is calculated and compared.
- This Algorithm to overcome the limitations of both C-DSIC and C-BIC. The winner determination and payment rule are different compared to C-DSIC and C-BIC.
- Compute virtual cost for every cloud vendor. In our model, virtual cost is a function of cost and QoS.
- To rank the cloud vendors based on their virtual costs. The cloud vendor with lowest virtual cost is declared the winner.
- The payment is computed based on the quoted cost and the expectation of the allocation.
- The procurement cost for each mechanism in every scenario is calculated in the presence of different cloud vendors.

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- So the procurement cost decreases as the number of cloud vendors increases.
- The procurement cost in C-OPT depends on the cost valuation of the user.
- C-OPT satisfy all the properties except allocative efficiency.

Cloud Vendor	Resource	C-DSIC	C-BIC	C-OPT
Service Provider1	40GB	289.6	225.5	1005.5
Service Provider2	30GB	243.5	107.6	616.8
Service Provider3	20 GB	165.8	46.5	232.9

Fig 1: Procurement cost -1

Cloud Vendor	Resource	C-DSIC	C-BIC	C-OPT
Service Provider1	40GB	256.6	220.5	500.5
Service Provider2	30GB	243.5	100.6	250.8
Service Provider3	20 GB	165.8	79.5	212.9

Fig 2: Procurement cost -2

VII. CONCLUSION AND FUTURE WORK

The simulation results showed that the proposed algorithm performs automated resource procurement. The proposed algorithm provides the limitations of both C-DSIC and C-BIC. Compute the virtual cost for every cloud vendor. In our model, virtual cost is a function of cost and Quality of Service. To rank the cloud vendors based on their virtual costs. The cloud vendor with lowest virtual cost is declared the winner. The payment is computed based on the quoted cost and the expectation of the allocation. So the procurement cost decreases as the number of cloud vendors increases. The procurement cost in C-OPT depends on the cost valuation of the user. C-OPT satisfy all the properties except allocative efficiency. In this paper are based on the pricing mechanism. While doing without Cloud broker the pricing mechanism is increasing high accuracy. Previously the cloud broker is acting as a middleware of both users and service providers. In this case the cloud broker is choosing which Service provider is best and which one is cheaper. In this case the problem is Cloud broker sometimes acting as favor of Service provider then the Cloud users may suffer and they will think unreliability of the Cloud. In future, to provide a good service without contacting cloud broker. Once user give requirements to service provider then the Service provider will give their information to users and periodically updated through service provider.

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