Chapter 7
Feasibility of Providers' Coalition in Reverse Auction-Based Cloud Market

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ABSTRACT

Cloud computing has revolutionized the IT world by its benefits. Cloud users can take relational and non-relational databases in the form of services or can run their own database on computing resources provided by the cloud. With evolution of cloud, new challenges are emerging, and the responsibility of the professional is to provide solution to these challenges. Dynamic pricing of computing resources in the cloud is now widely acceptable by its users. But in the current market of cloud, reverse auction (a mechanism to implement dynamic pricing) is not getting the attention from professionals that it deserves. This work is an effort to identify the facts in the cloud market that are responsible for current condition of reverse auction. In this work, from the identified limitations of current cloud market and case study on existing model for reverse auction in cloud, one can observe that coalition of small cloud providers with common interoperability standard in reverse auction is a feasible solution to encourage cloud market for adapting reverse auction-based resource allocation.

INTRODUCTION

Cloud computing is a business model of computing that delivers computing resources as a service over the internet to users (Sajid and Raza, 2013). Even one can pay using credit card to utilize powerful computing servers in very less time. Among all the services provided by a cloud platform, Database-as-a-service (DBaaS) becomes popular in recent times as many modern business applications and operational systems run using this type of service (Hacigümüş, Iyer and Mehrotra, 2002). Forrester defines DBaaS as "*An on-demand, secure, scalable, and self-service database that automates the database provisioning and administration to support new and existing business applications and operational systems*" (Forrester, 2019).

In this kind of service, a cloud data center has the capability to run database, and access to the cloud service provider (SP) is provided to the cloud users as a service as similar to other type of services e.g. computing, network, storage etc. Using DBaaS, provisioning of relational and Non-relational databases takes only a few minutes without any technical complexity. Moreover, a cloud user can purchase some virtual resources (i.e. virtual machines) and can run its own database on these virtual machines (Hacigümüş, Iyer and Mehrotra, 2002). The report publishes by Forrester (Forrester, 2019) depicts the fact that a large number of SPs are offering Database-as-a-service in cloud market. Some Examples of DBaaS are Amazon's DynamoDB, Google's Cloud FireStore, EnterpriseDB's EDB Postgres Cloud Database Service (CDS), IBM's Db2, MongoDB Atlas etc. (Forrester, 2019).

Dynamic allocation of Virtual Resources is one of the major benefits of cloud. Market of cloud resources are growing very fast and competition is increasing day by day. Even developing countries are encouraging their agencies and professionals to take services of cloud, so that, they would be more focused on effectiveness of their programs (as one knows that cloud computing reduces the overhead related to infrastructure). Recently Government of India announced to provide subsidy for taking services of cloud (Times, 2017). Since number of customer is also increasing, prediction of demand of resource is very tough for SPs. This makes dynamic resource allocation is also an important research problem (Baranwal *et al.*, 2018a). Since it is a business model of computing, price acts as a lever that can help to control this dynamism (Baranwal *et al.*, 2018a).

Though dynamic pricing supports healthy competition and increases the utilization of resource (Mihailescu and Teo, 2010), but dynamism in pricing creates difficulty to customer in budget planning and to SPs in pricing of resource. Auction, which handles dynamism very well, is one of the implementations of dynamic pricing. In auction, there are two important entities; Auctioneer and Bidder. Auction can be of three types on the basis of role of customer and provider: Forward Auction, Reverse Auction, and Double Auction (Baranwal *et al.*, 2018b). In forward auction, SP acts as auctioneer while customers are bidders, which compete to get resources offered by SP in the auction. Highest paying customer is the winner in forward auction. Reverse auction is just opposite of forward auction. In this, customer acts as auctioneer; SPs are bidders who compete to allocate resource and get payment. SP with lowest payment expectation wins in reverse auction. While in double auction, both customers and SPs are bidders i.e. bidding from both sides. Double auction is basically a solution for resource matching problem (Parsons, Rodriguez-Aguilar and Klein, 2011) (Kumar *et al.*, 2017).

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