PROFIT MAXIMIZATION FOR CLOUD BROKERS IN CLOUD COMPUTING

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ABSTRACT

Along with the development of cloud computing, more and more applications are migrated into the cloud. An important feature of cloud computing is pay-as-you-go. However, most users always should pay more than their actual usage due to the one-hour billing cycle. In addition, most cloud service providers provide a certain discount for long-term users, but short-term users with small computing demands cannot enjoy this discount. To reduce the cost of cloud users, we introduce a new role, which is cloud broker. A cloud broker is an intermediary agent between cloud providers and cloud users. It rents a number of reserved VMs from cloud providers with a good price and offers them to users on an on-demand basis at a cheaper price than that provided by cloud providers. Besides, the cloud broker adopts a shorter billing cycle compared with cloud providers. By doing this, the cloud broker can reduce a great amount of cost for user. In addition to reduce the user cost, the cloud broker also could earn the difference in prices between on-demand and reserved VMs. In this paper, we focus on how to configure a cloud broker and how to price its VMs such that its profit can be maximized on the premise of saving costs for users. Profit of a cloud broker is affected by many factors such as the user demands, the purchase price and the sales price of VMs, the scale of the cloud broker, etc.. Moreover, these factors are affected mutually, which makes the analysis on profit more complicated. In this paper, we firstly give a synthetically analysis on all the affecting factors, and define an optimal multiserver configuration and VM pricing problem which is modeled as a profit maximization problem. Secondly, combining the partial derivative and bisection search method, we propose a heuristic method to solve the optimization problem. The near-optimal solutions can be used to guide the configuration and VM pricing of the cloud broker. Moreover, a series of comparisons are given which show that a cloud broker can save a considerable cost for users.

Keyword : Profit,Cloud, Vm, Cost ,Brokers .

1 Introduction :

Over the past few years, cloud computing has experienced tremendous development. More and more cloud providers have jumped on the cloud bandwagon, and they centrally manage a variety of resources such as hardware and software and deliver them over the internet in the form of services to customers on demand. Thanks to unique properties such as elasticity, flexibility, apparently unlimited computational power, and pay-as-you-use pricing model, cloud computing can reduce the requirement of clients for large capital outlays for hardware necessary to deploy service and the human expenses to operate it [4]. Hence, an increasing number of clients are transferring their business to the cloud.

One important feature of cloud computing is pay-asyou-use which contains two meanings. First, according to the customer resource demand such as CPU, memory, etc., the physical machines are dynamically segmented using virtualization technologies and provided to customers in the form of virtual machines (VMs), and customers pay according to the amount of resources they actually consumed. Second, the VMs can be dynamically allocated and de allocated at anytime, and customers should pay based on how long the resources are actually used. Nevertheless, the pay-as-you-use pricing model is presently only conceptual due to the extreme complexity in monitoring and auditing resource usage [8], and cloud providers usually adopt an hourly billing scheme; in other words, the Billing Time Unit (BTU) of the cloud providers is one hour, for instance, Amazon EC2 [9]. Therefore, the customers should pay for the resources by the hour even if they do not actually utilize the allocated resources in the whole billing horizon [10]. This leads to a waste of resources and raises the cost of customers to a certain degree.

In addition, almost all cloud providers provide two main ways to pay for their instances: On-Demand and Reserved Instances [11, 12]. With On-Demand instances, users pay for compute capacity by per hour depending on which instances they run, and they are recommended for the applications with short-term workloads. Reserved Instances provide users with a significant discount (up to 75% in Amazon EC2) compared to On-Demand instance pricing, but customers should rent instances for long periods, e.g., from six months to several years, according to the current plans offered by real cloud providers such as Amazon [9] and Microsoft Azure [13]. Obviously, this discount cannot be enjoyed by the short-term customers.

Due to above two reasons, the short-term customers always should pay more than they actually must pay. To reduce cost for this part of customers, we introduce the cloud broker, an intermediary agent between cloud providers and customers. Fig. 1 shows the relationship among the cloud broker, cloud providers, and customers. The cloud broker rents the reserved VMs from cloud providers for long periods with the reserved price and outsources the resources as on-demand VMs to customers for a lower price with respect to the price that the cloud providers charge for the same VMs. A cloud broker can help to reduce the cost of customers from two aspects. First, the cloud broker takes advantages of the price gap between reserved and on-demand VMs, renting the reserved VMs with a good price and outsourcing them as on-demand VMs with a lower price compared with the same VMs provided by cloud providers. Second, the cloud broker adopts a smaller billing cycle (BTU) than the cloud providers. Adopting the two strategies, the resource utilization can be efficiently increased and the customer requests can be accommodated with less cost.

In addition to helping customers to reduce their cost, the cloud broker can earn a huge difference in price between the reserved and on-demand VMs [14]. Making profit is one of the main objectives of all enterprises. Hence, in this paper, we focus on how to maximize the profit of the cloud broker, and mean while, the customer cost can be reduced efficiently.

Like all business, the profit model of a cloud broker in cloud computing is based on two components, namely, the revenue and the cost. For a cloud broker, the revenue is the service charge to users, and the cost is the renting cost paid to cloud service providers. A profit model of a cloud broker includes many considerations, such as the scale (the number of VMs) of a cloud broker system, the customer demand(the rate that requests submitted to a cloud broker), the renting price(the cost price) that the resources are rented from cloud providers, the selling price (the sales price) that the cloud broker provides resources to users, the BTU, and so forth. To maximize the profit of a cloud broker, we should understand both revenue and cost, and in particular, how they are affected by those factors.

The revenue of a cloud broker is determined by two factors, i.e., the customer demand and the sales price. The customer demand is measured by the task arrival rate of the cloud broker in this paper. Under a given sales price, the greater (smaller, respectively) the customer demand is, the higher (lower, respectively) the revenue is.

Similarly, under a given customer demand, the higher (lower, respectively) the sales price goes, the more(less, respectively) the revenue can be obtained. Moreover, the sales price has a great impact on the customer demand of a cloud broker. If the sales price of the on-demand VMs offered by the cloud broker are much cheaper compared with the same VMs provided by the cloud providers, more customers are attracted to submit their computing requests to the cloud broker. On the contrary, if the cloud broker raises the sales price of VMs, the customer demand decreases correspondingly. Hence, determining a proper sales price is a key issue for cloud brokers to maximize their profit, which will be calculated in this paper.

The cost of a cloud broker is also determined by two factors, i.e., the cost price of resources and the scale of the service system. The cost price of resources is determined by cloud providers. The service system can be modeled as a multi server system, which consists of many resources (VMs) rented from cloud providers. The system scale determines the service capacity of the cloud broker. A cloud broker with a larger system scale can serve more customers, which can obtain more revenue but generate an increasing cost. Hence, the system scale also should be determined properly such that the profit of a cloud broker is maximized.

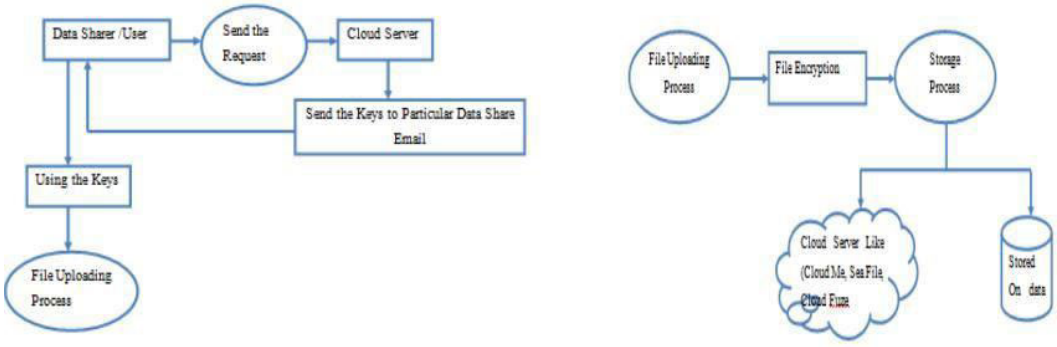


Fig : Architecture

2 LITERATURE SURVEY

YEAR	TITLE	METHODOLOGY	RESEARCH PROPOSAL	ALGORITHM
2012	Optimization of Resource Provisioning Cost in Cloud Computing	An optimal cloud resource provisioning (OCRP) algorithm is proposed by formulating a stochastic programming model. The OCRP algorithm can provision computing resources for being used in multiple provisioning stages as well as a long-term plan, e.g., four stages in a quarter plan and twelve stages in a yearly plan. The demand and price uncertainty is considered in OCRP	In this paper, different approaches to obtain the solution of the OCRP algorithm are considered including deterministic equivalent formulation, sample-average approximation, and Benders decomposition	OCRP algorithm

2013	Optimal Multi Server Configuration for Profit Maximization in Cloud Computing	Our approach is to treat a multi-server system as an M/M/m queuing model, such that our optimization problem can be formulated and solved analytically.	Two server speed and power consumption models are considered, namely, the idle-speed model and the constant-speed model. The probability density function of the waiting time of a newly arrived service request is derived. The expected service charge to a service request is calculated.	M/M/m queuing model
2015	Efficient Heuristics for Profit Optimization of Virtual Cloud Brokers	Seven fast and accurate two-phase heuristics and a reordering local search algorithm were proposed to solve the VMMP problem. They focus on different aspects, such as VM cost or QoS.	This article introduces the VMMP, a relevant problem when planning resource utilization in virtual cloud infrastructures. We focus on a novel cloud brokering business in which a virtual broker manages its own virtual cloud, composed by a number of reserved resources in a number of cloud providers.	Heuristic approach
2016	Maximizing Profit of Cloud Brokers under Quantized Billing Cycles	Two deterministic online algorithms were designed to increase the profit of cloud brokers in the presence of QBC. The competitive ratio of both the algorithms were derived. We showed the importance of demand prediction by deriving a better competitive ratio for the partial online algorithm than those found in ski-	We discussed the unique challenge posed by the presence of quantized billing cycles. The dynamic pricing strategy proposed in this paper can be considered as an alternative to the work done to maximize the profit of the cloud broker. Merging our algorithm will lead to cloud broker has to decide whether to reduce	Dynamic Pricing Strategy based on Ski-Rental Problem

		rental literature	the demand by increasing the VM price buy on demand VMs to support the demand.	
2018	Maximizing the Profit of Cloud Broker with Priority Aware Pricing	To solve the idle resource waste, we first design a fair and priority aware pricing scheme, Priority Pricing, for the broker which charges users with different prices based on priorities. Then we propose three dynamic algorithms for the broker to make resource reservations with the objective of maximizing its profit	In this paper, we propose cloud brokerage services considering both pricing scheme with cloud users and reservation methods with cloud providers, in which two types of priorities are utilized to design the priority aware pricing and priority-based reservation algorithms.	period decision algorithm and greedy decision algorithm

3 Existing System

The Virtual Cloud Broker rents several reserved instances of different VMs from several cloud providers for long periods of time and outsources them as on-demand VMs for a lower price with respect to what traditional cloud providers charge for the same VMs. The VCB earns the significant difference in price between reserved VMs and on-demand VMs. Because the reserved instances bought by the VCB are limited. In case it cannot fulfil all requests without violating the contracted Service Level Agreement (SLA), on demand VMs are bought from public cloud providers to satisfy the demand, which leads to a reduction in profit.

4 Proposed System

Here we study the problem of optimal multi-server configuration and resource pricing for profit maximization of cloud brokers. To maximize the profit of cloud brokers, we provide a comprehensive analysis on the profit affecting factors and formulate a profit maximization problem. By solving the optimization problem, the optimal VM price and system scale can be obtained such that the profit is maximized.

To reduce the cost of cloud users, a novel business role between cloud providers and cloud users, i.e., cloud broker, is introduced. A cloud broker is treated as a multi-server system, which is modelled as an M/M/n/n queuing model. Based on this model, all the profit-affecting factors are analysed. A detailed analysis on the relationship between the sales price of VMs and the customer demand is given. Based on the analysis, the expected charge to a VM request is calculated. A series of numerical calculations are conducted, which show that the cloud broker can reduce the cost for cloud users efficiently and yet make a considerable profit at the same time

5 MODULES

1. Customer
2. Broker
3. Server

Modules Description

1. **Customer**

   Here the customer has to register with the application then only the customer has to login with the application after successful login the customer can perform some actions such as cloud request, upload, view file details, Rent Request, view request, rental space, logout.

2. **Broker**

   Here the broker no need not to register with the application directly can login, after successful login the broker can perform some actions such as customer request, cloud storage, view users, logout

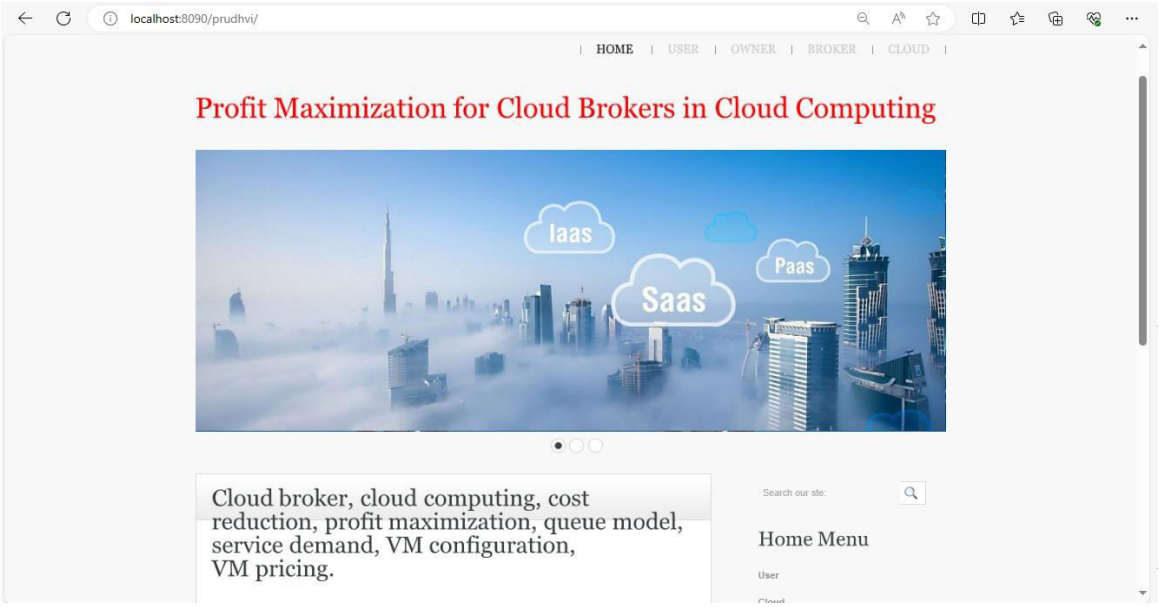
3. **Server**

   Here the server no need not to register with the application directly can login, after successful login the server can perform some actions such as customer request, view users, logout.

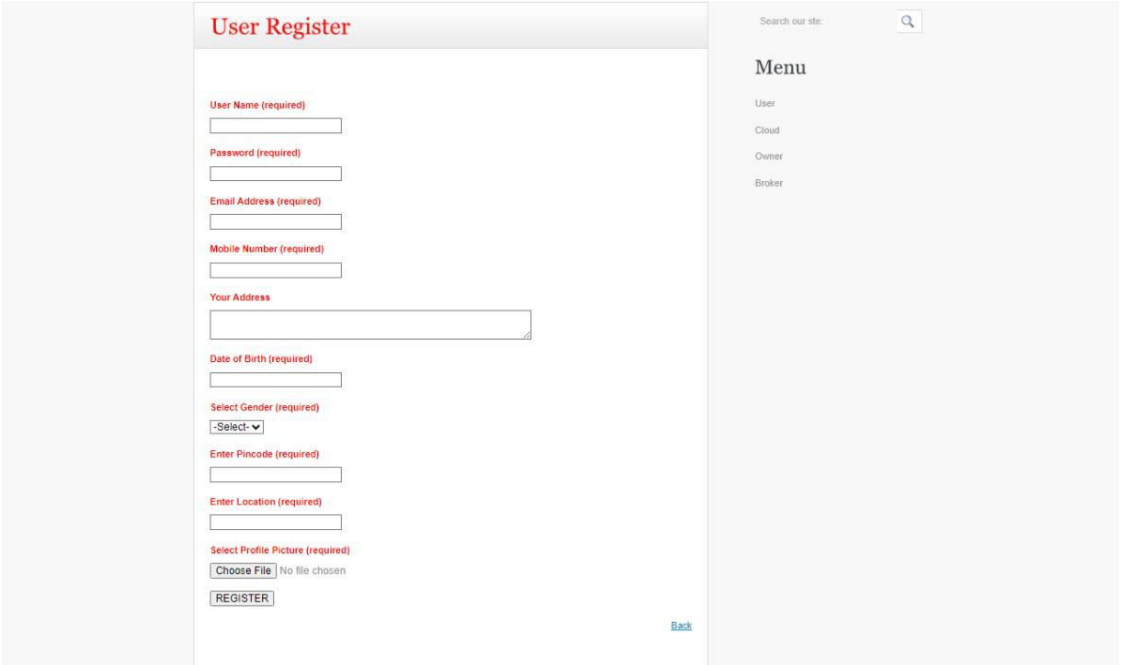
6 Results :

OUTPUT SCREENS:

Home:

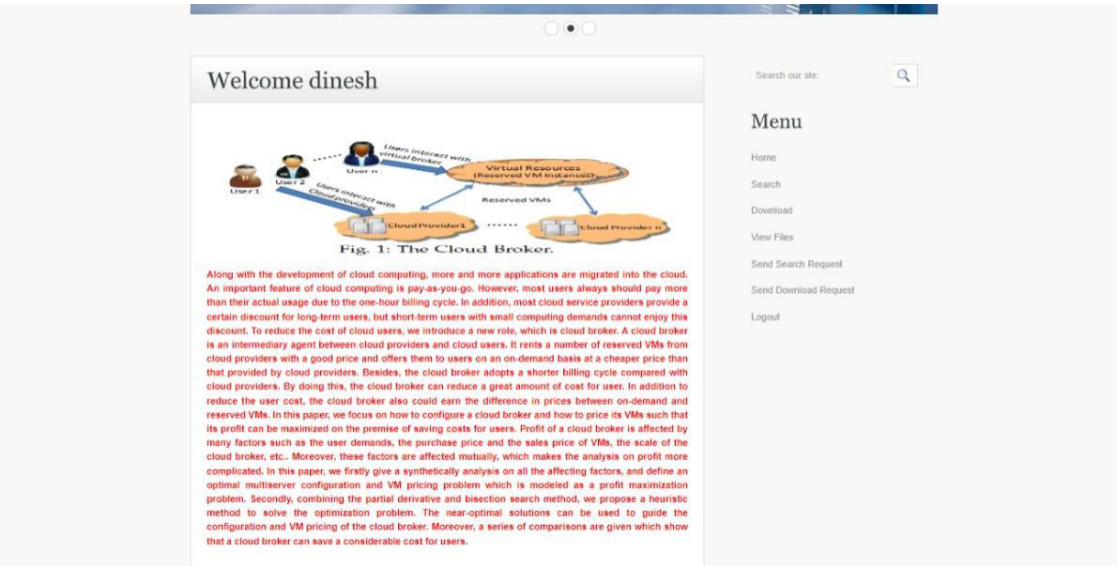


User Registration:

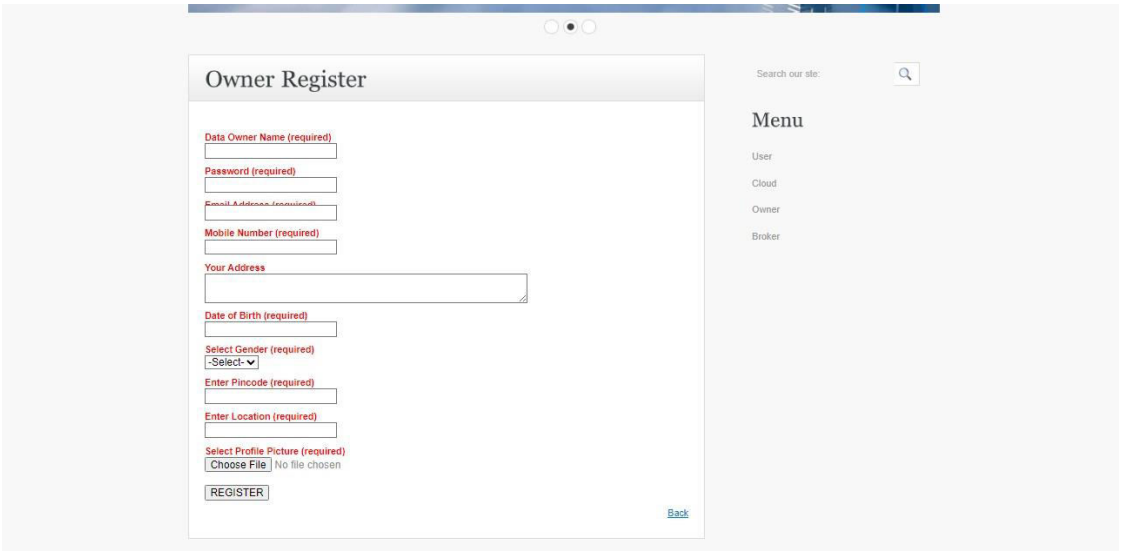


User Login:

User Home:

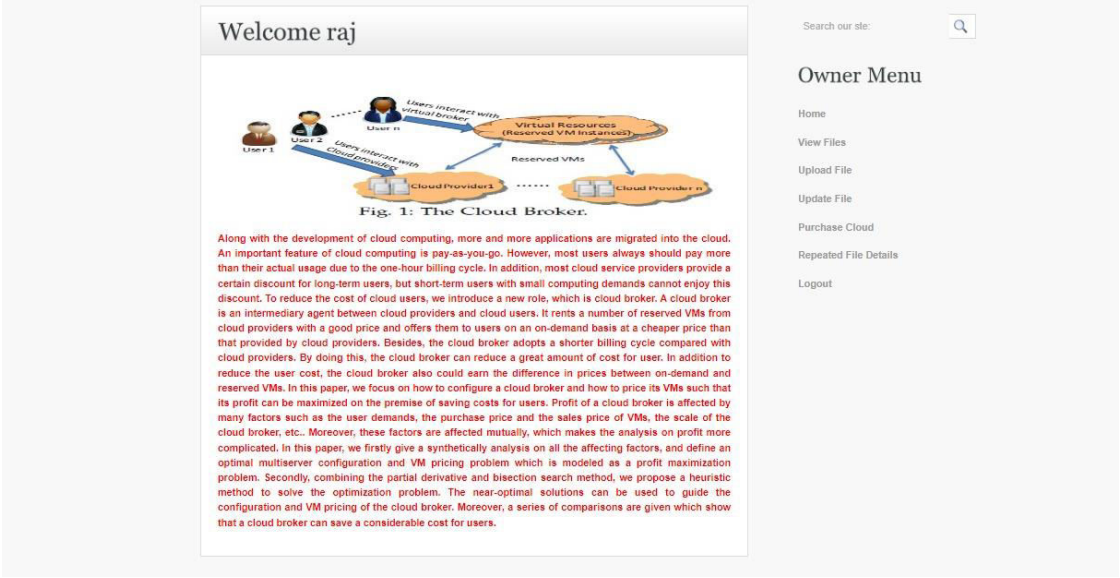


Owner Registration:

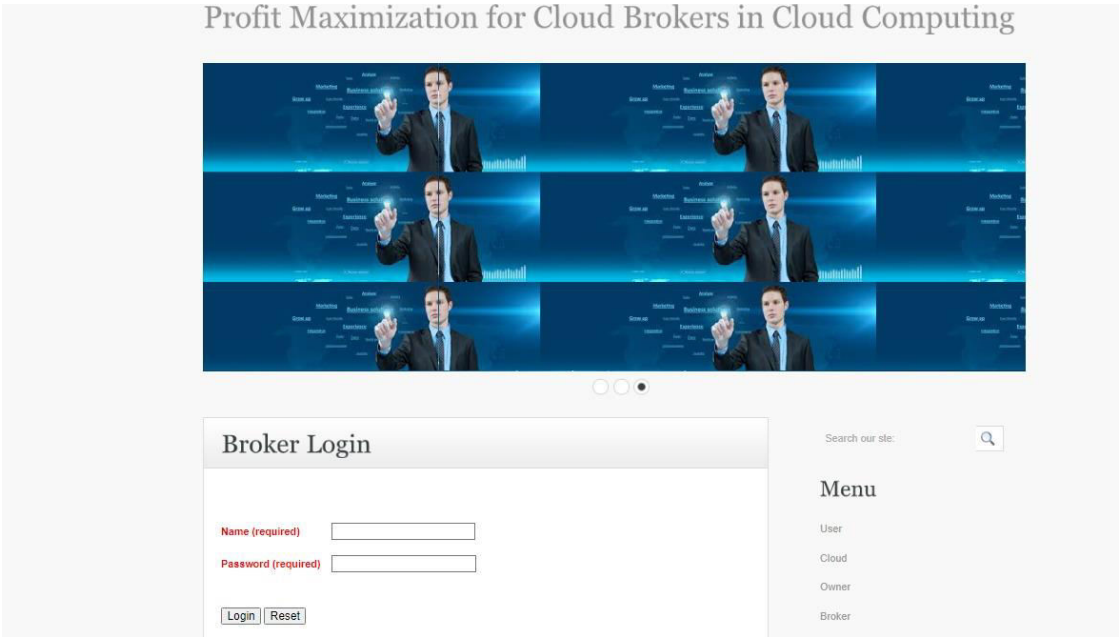


Owner Login:

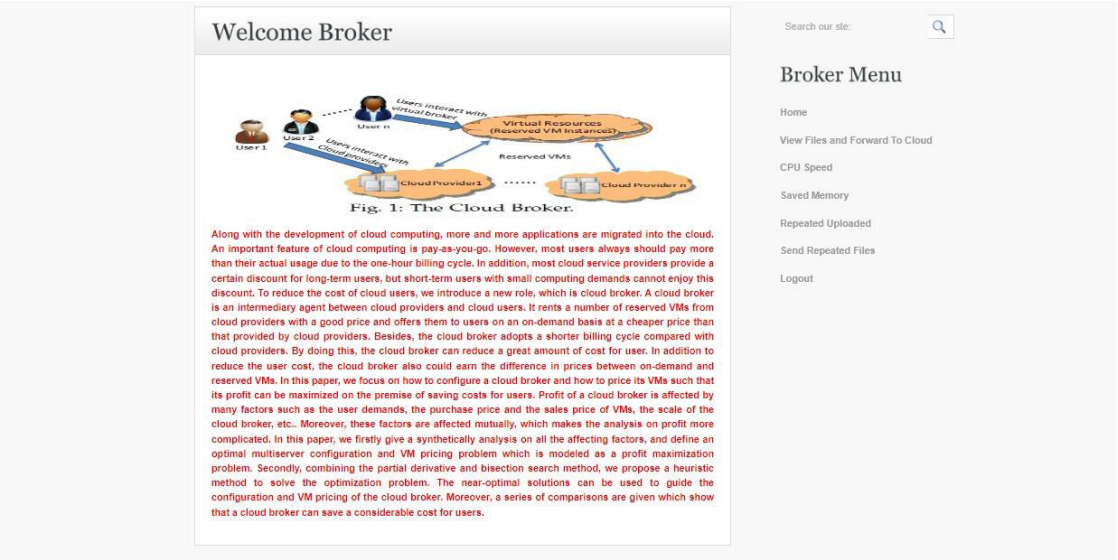
Owner Home Page:



Broker Login Page:

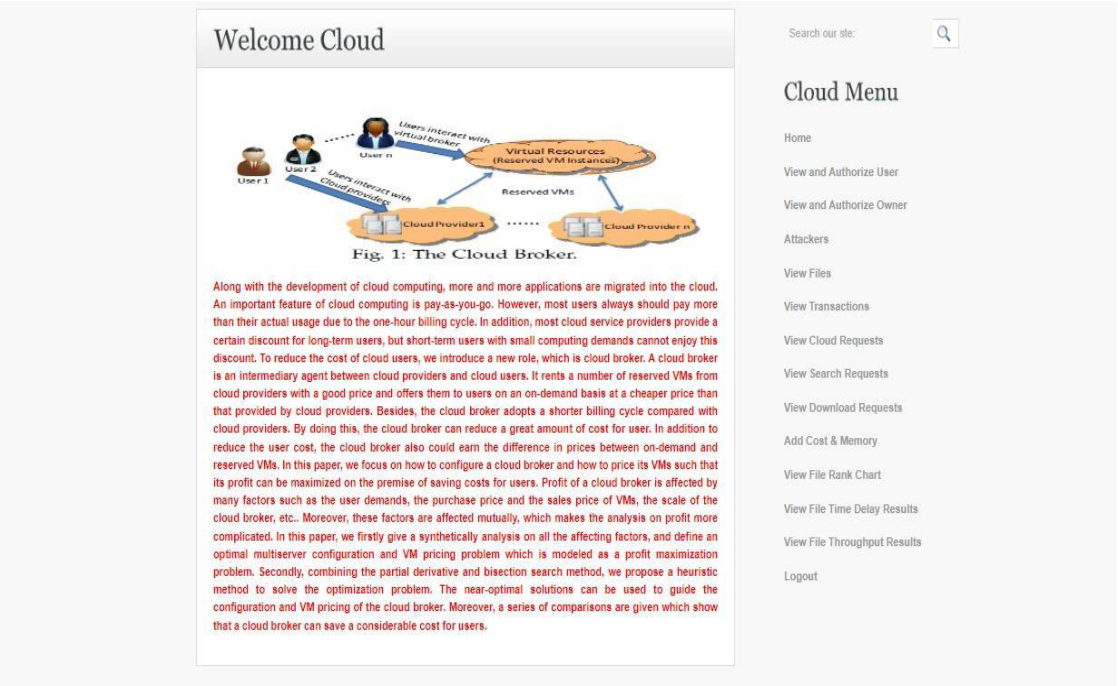


Broker Home Page:



Cloud Login:

Cloud Home Page:



7 CONCLUSION

In this paper, we focus on the profit maximization problem of cloud brokers. A cloud broker is an intermediary entity between cloud service providers and customers, which buys reserved instances from cloudproviders for long periods of time and outsources them as on-demand VMs for alower price and fine-grained BTU with respect to what the cloud service providers charge for the same VMs. Due to the lower service price and the finer-grained BTU compared with the public clouds, the cloud broker can save much cost for customers. This paper tries to guide cloud brokers on how to configure the virtual resource platform and how to price their service such that they can obtain the maximal profit. To solve this problem, the virtual resource platform is modeled as an M/M/n/n queue model, and a profit maximization problem is built in which many profit-affecting factors are analyzed based on the queuing theory, as well as the relationship between them. The optimal solutions are solved combining the partial derivative and bisection method. Lastly, a series of calculations are conducted to analyze the changing trend of profit and the ratio of user cost savings. In this paper, we adopt the linear price-demand price when we analyze the broker's profit since it is the most common function in real market. Whereas, different cloud markets might show different price-demand relationship. Hence, we will extend our study to consider more complicated price-demand curves in the further.

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