International Journal of Pure and Applied Mathematics
Volume 119 No. 14 2018, 1461-1471
ISSN: 1314-3395 (on-line version)
url: http://www.ijpam.eu
Special Issue
ijpam.eu

PROFIT MAXIMIZATION SCHEME WITH GUARANTEED QUALITY OF SERVICE IN CLOUD COMPUTING

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ABSTRACT

As an efficient and effective way to provide computing resources and services to the customers on demand cloud computing has become most popular. From cloud service providers' perspective, profit is one of the most important considerations, and it is mainly determined by the configuration of a cloud service platform under given market demand. Generally single renting scheme is used to configure a cloud infrastructure though it cannot assure the service quality and also it leads to serious wastage of resources. A double resource renting scheme is designed firstly in which short-term renting and long-term renting are combined aiming at the existing issues. This double renting scheme can be efficient and guarantee the quality of service of all requests and reduce the resource waste greatly. Secondly, a service system is considered as an M/M/m+D queuing model and the performance indicators that affect the profit of our double renting scheme are analyzed, e.g., the standard charge, the proportion of requests that need temporary servers, and so forth. Thirdly, a profit maximization problem is formulated for the double renting scheme and the optimized configuration of a cloud platform is obtained by solving the profit maximization problem. Ultimately, a series of calculations are conducted to measure the profit of our proposed scheme with that of the single renting scheme.

Keywords: Business Service Provider , Infrastructure Service Provider, Quality of Service (QoS), Double-Quality Guaranteed renting scheme, Customer Satisfaction.

INTRODUCTION

Cloud computing is the delivery of resources and computing as a service rather than a product over the Internet, such that accesses to shared hardware, software, databases, information, and all resources are provided to consumers on demand [1]. Customers use and pay for services on demand without considering the upfront infrastructure costs and the subsequent maintenance cost [2]. New IT commercial model, profit is an important concern of cloud service providers. As shown in Fig. 1, the cloud service providers rent resources from infrastructure providers to configure the service platforms and provide paid services to customers to make profits.

For cloud service providers, how to configure their cloud service platforms to obtain the maximal profit. Cloud service providers rent resources from infrastructure providers to configure the service platforms and provide paid services to customers to make profits.

The optimal configuration problem with profit maximization of cloud service providers with customer satisfaction. To configure a cloud service platform, a service provider usually adopts a single renting scheme. That's to say, the servers in the service systems are all long-term rented. Because of the limited number of servers, some of the incoming service requests cannot be processed immediately.

So they are first inserted into a queue until they 'can handle by any available server. Based on the definition of customer satisfaction level in economics, develop a simple calculation formula for measuring customer satisfaction in cloud Computing.

Investigate the interrelationship between profit and customer satisfaction, and build a profit optimization model considering customer satisfaction. Adopt a double quality guaranteed scheme to find the optimal cloud configuration such that the profit is maximized.
The optimal configuration problem with profit maximization of cloud service providers has been researched in our previous researches [2], [6] which assumed that the cloud service demand is known in advance and not affected by external factors. However, the request arrival rate of a service provider is affected by many factors in actual, and customer satisfaction is the most important factor. For example, customers could submit their tasks to a cloud computing platform or execute them on their local computing platforms.

Depending upon the definition of customer satisfaction, we build a profit maximization model in which the effect of customer satisfaction on quality of service (QoS) and price of service (PoS) is considered.

1. REVIEW OF RELATED WORK

In this section, we first review the literatures concerning customer satisfaction, and then the profit maximization problem in cloud computing.

To estimate the service demand of a service provider, it is critical to measure its customer satisfaction. In business management, there have been many specialists who focus on the researches of the definition of customer satisfaction [7], [8], [9], [10], [11]. The concept of customer satisfaction is first proposed by Cardozo [7] in 1965 and he believed that high customer satisfaction produces purchase behavior again.After that, many different definitions are proposed for customer satisfaction. Howard and Sheth [8] considered customer satisfaction as the sychological states of a customer when evaluating the reasonability of pay and gain. Churchill and Surprenant [9] considered customer satisfaction as the comparison results between the payment to buy a product or service and the benefit using this product or service. Tes and Wilton [10] defined customer satisfaction as evaluation of the difference between prior expectation and cognitive performance. Parasuraman et al. [11] believed that customer satisfaction is a function of QoS and PoS. Although thesedefinitions are described differently, their ideas are consistent with that of discrepancy theory [12], [13], that is, in any case, customer satisfaction is determined by the difference between prior expectation and actual cognitive afterwards.

Chaisiri et al. [18] took into consideration the uncertainty of the customers demand, and proposed a stochastic programming model with two-stage recourse to solve the profit maximization problem for the service providers. Cao et al. [2] proposed an optimal multiserver configuration strategy. Through the optimal strategy, the optimal configuration of multiserver system, i.e., the server size and the server speed, can be determined such that the profit of a multiserver system is maximized. Some papers consider the profit problem under different cloud computing environments.

Morshedlou and Meybodi [28] defined the users' satisfaction level based on expected value of user's utility that a user attaches to a certain monetary amount. Even though, the existing formulas comparing customer satisfaction of cloud computing cannot clearly reflect the definition of customer satisfaction, and they did not take into account user's psychological differences.

In recent years, cloud computing has become a booming service industry. How to increase profit is an important issue for cloud service providers. Many works have been done to research this issue [2], [14], [15], [16], [17], [18], [19]. There are some researches focusing on the profit maximization problem of the service providers.

There are some works in cloud computing which consider customer satisfaction [20], [21], [12], [13], [14], [15], [16], [17], [18]. Chen et al. [20] adopted utility theory leveraged from economics and developed an utility model for measuring customer satisfaction in cloud. In the utility model, consumer satisfaction is relevant to two factors: service price and response time. They assumed that consumer satisfaction is decreased with higher service price and longer response time. In [21], the user satisfaction is calculated as the ratio of the actual QoS level and the expected QoS level. Wu et al. [12] proposed an admission control and scheduling algorithms for SaaS providers to maximize profit by minimizing cost and improve customer satisfaction level. Even though, they did not give a specific formula to compare customer satisfaction level. Chao et al. [14] proposed a customer satisfaction-aware algorithm based on the Ant-Colony Optimization (AMP) for geo-distributed datacenters.

However, the existing formulas measuring customer satisfaction of cloud computing cannot properly reflect the definition of customer satisfaction, and they did not take into account user's psychological differences.
To address this problem, we use the definition of customer satisfaction leveraged from economics and develop a formula to measure customer satisfaction in cloud. And then, how cloud configuration affects customer satisfaction and how customer satisfaction affects the profit of cloud service providers are analyzed. Based on these works, a profit maximization problem considering customer satisfaction is formulated and solved such that the optimal configuration is obtained.

Problem Definition. To maximize the profit of a service provider, an optimal configuration scheme should be decided by finding a solution (m; s) to the following optimization problem considering customer satisfaction

(i.e) maxG(m; s)

2. MATERIALS AND METHODS

Earlier models **(single quality guarantee scheme)** adopts long term pricing model so it considers the power consumption. But Great amount of resources is wasted due to the uncertainity of workload and also it cannot guarantee the quality of all requests, waiting time of the service requests is too long, Sharp increase of the renting cost of the servers, increase of the electricity cost of the servers, increased cost may counterweight the gain from fine reduction and so we have proposed **novel double renting scheme** is proposed for service providers. To reduce resource wastage and increase quality of service, long term renting and short term renting are integrated in it.

3. PROFIT MAXIMIZATION:.

We have proposed a pricing model for cloud computing which takes many factors into considerations, such as the requirement r of a service, the workload of an application environment, the configuration (m and s) of a multi-server system, the service level agreement c, the satisfaction (a and s) of a consumer, the quality (C and T) of a service, the fine p for a service with low quality , the renting cost, the energy consumption cost, and a service provider's margin and profit a. The problem of optimal multi-server configuration for profit maximization in a cloud computing environment is formulated and solved by using M/M/m+D queuing model. Our discussion can be easily extended to other service charge functions. Our methodology can be applied to other pricing models. At three-tier cloud structure, which consists of infrastructure vendors, service providers and consumers, the latter two parties are particular interest to us. Clearly, scheduling strategies in this scenario should satisfy the objectives of both parties. Our contributions are on the development of a pricing model using processor-sharing for clouds, the application of this pricing model to composite services with dependency consideration, and the development of two sets of profit-driven scheduling algorithms.

Assume that the number of virtual machines in a server is fixed and cannot be changed during the runtime. Each arriving request enters the multiserver system and waits in a queue with infinite capacity when all the servers are busy.

A pricing model is developed for cloud computing which takes many factors into considerations, such as the requirement r of a service, the workload of an application environment, the configuration (m and s) of a multi-server system, the service level agreement c, the satisfaction (a ands0) of a consumer, the quality (C and T) of a service, the fine p for a service with low quality, the renting cost, the energy consumption cost, and a service provider's margin and profit. Profit can be maximized by scheduling the job according to optimization of speed and size of the input. Cloud computing is the technology of the next generation which unifies everything into one. It is an on demand service request because it offers dynamic flexible resource allocation for reliable and guaranteed services in pay use manner to users.

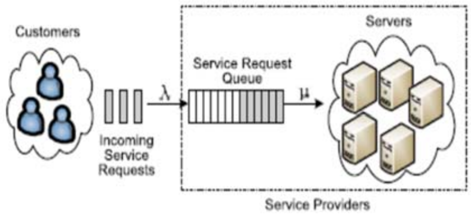

Fig. 1 Queuing Model

QoS is affected by many factors such as the service time, the failure rate and so forth. However, in this paper, we measure the QoS of a request by its response time for two reasons. First, the service time is easily measured. Second, it gives customers an intuitive feeling of QoS. For customers, they do not care how failures are managed when failures occur.

They only care whether the task can be completed successfully and how long it takes. The response times of requests are different from each other due to the changing system workload and limited service capacity, which leads to different QoS and QoS satisfaction. In general, each customer has a tolerable response time which is related to the execution requirement of its requests.

If the response time of a request exceeds the tolerable value, the customer feels dissatisfaction about the service, which leads to the degrade of the overall customer satisfaction of the service provider.

To protect the interests of customers and maintain the customer satisfaction, there is always a service-level agreement between a service provider and customers in which the QoS and the corresponding charge are stipulated.

The cost of a service provider is mainly used to pay the rent and the electricity fee. A service provider rents servers from an infrastructure provider and pays the corresponding rent.

The rent is determined by the number of rented servers and the rental price per server per unit of time. Assume that the rental price of one server per unit of time.
We present the service model first. Besides, Service-Level Agreement is also introduced, which is a negotiation about the charge and the QoS between cloud service providers and customers.

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This work proposes a novel estimating request plan intended for a cloud reserve that offers querying administrations and goes for the expansion of the cloud benefit with prescient interest value solution on monetary method for client benefit. The proposed arrangement permits: on one hand, long haul profit amplification with value minimization on solicitation of same interest, and, on the other, dynamic adjustment to the genuine conduct of the cloud application, while the improvement process is in advancement.

4. PRICING STRATEGY

A pricing model is developed for cloud computing which takes many factors into considerations, such as the requirement r of a service, the workload of an application environment, the configuration of a multiserver system, the service level agreement c the satisfaction (r and s0) of a consumer, the quality (C and T) of a service, the fine p of a low quality service, the renting cost, the energy consumption cost, and a service provider's margin and profit. According to the optimization of speed and size of the input profit can be maximized by scheduling the job.

Keeping in mind the end goal to ensure the nature of administration demands and boost the benefit of service providers, Double Quality Guaranteed - DQG scheme has been proposed for the leasing plan of service suppliers. Long haul fleeting leasing and fleeting haul leasing can be combined, which can lessen the asset squander significantly and adjust to the dynamical interest of processing capacity in this scheme. An M/M/m+D queueing model is work for our multiserver framework with changing system size. And after that, a n ideal setup issue of benefit amplification is detailed in which numerous elements are taken into contemplations, for example, the business sector request, the workload of demands, the server level understanding, the rental expense of servers, the expense of vitality consumption, et cetera. The ideal arrangements are tackled for two unique circumstances, which are the perfect ideal arrangements and the real ideal arrangements. A serious of calculations is directed to think about the benefit got by the DQG leasing plan with the Single Quality Unguaranteed (SQU) leasing plan. The results demonstrate that our plan outperforms the SQU plan as far as both of administration quality and benefit. We have proposed a pricing model for cloud computing which takes many factors into considerations, such as the requirement r of a service the workload λ of an application environment, the configuration (m and s) of a multiserver system, the service level agreement c, the satisfaction (r and s0) of a consumer, the quality (C and T) of a service, the fine p for a service with low quality, renting cost, (α,Y,P*, and P) energy Consumption cost, and a service provider's margin and profit a.

M/M/ m queuing model is used and, we formulated and solved the problem of optimal multiserver configuration for profit maximization in a cloud computing environment. Our discussion can be easily extended to other service charge functions.

Our methodology can be applied to other pricing models. In this division, we put forward the Double Quality Guaranteed (DQG) resource renting scheme that combines long-term renting with short-term renting. The main computing capacity is provided by the long term rented servers due to their low price. The short term rented servers provide the extra capacity in peak period. Double Quality Guarantee - DQG renting model attains more profit than the Single Quality Unguaranteed - SQU renting model in guaranteeing the quality service and so it is proposed as the new scheme or model for Cloud service providers.

5. PROPOSED MECHANISM

A double renting scheme is proposed for cloud service providers. Both short term renting scheme and long term renting are combined to provide quality of service requirements, it will also reduce the resource waste greatly.

The performance indicators are analyzed such as the average service charge, the ratio of requests that need short-term servers, and so forth and a multiple server system adopted here is modeled as an M/M/m+D queuing model.

The ideal solutions and the actual solutions are obtained for maximizing profit and solving the optimal configuration problem of cloud service providers.

A series of comparisons are given to verify the performance of our scheme. The results show that the proposed Double-Quality-Guaranteed (DQG) renting scheme can achieve more profit than the compared Single-Quality-Unguaranteed (SQU) renting scheme in the premise of guaranteeing the service quality completely.

Since the requests with waiting time D are all assigned to interim servers, it is evident that all service requests can assure their deadline and are charged based on the workload according to the SLA so that the revenue of the service provider can be increased.

Increase in the quality of service requests and maximize the profit of service providers. DQG scheme eliminates great amount of resources is wasted due to the uncertainty of workload. It also guarantees the quality of all requests.

The Architecture of Double Quality Guaranteed Scheme consists of Queuing system which works on web server with the help of servlet and Jsp. It in turn establishes the link between the database and web server. Finally Queuing system helps in establishing connection between cloud storage and web server for managing infrastructure.

6. ARCHITECTURE

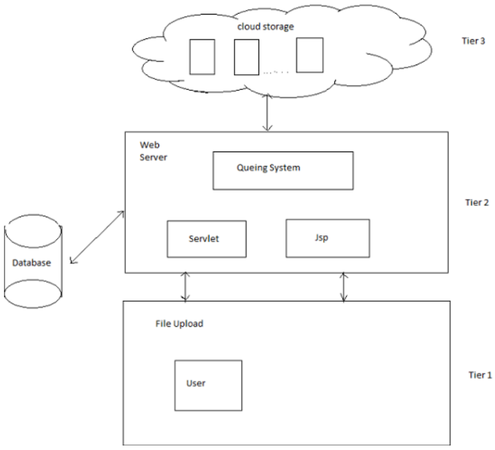


Fig.2 Architecture diagram

The above architecture of Double Quality-Guaranteed-scheme is implemented into the below various modules like cloud computing, Queuing Model, Business Service Module, Cloud Customer Module and Infrastructure Service provider Module.

6.1 CLOUD COMPUTING

It describes a type of outsourcing of computer services, similar to the way in which the supply of electricity is outsourced. Users can simply use it. They do not need to worry where the electricity is from, how it is made, or transported. Every month, they pay for what they consumed. Cloud computing uses logic same as the user can simply use storage, power of computing, or specially designed development environments, without having to worry how these work internally. Cloud computing is usually Internet based computing. It is a fashion in computing in which Information technology related capabilities are provided as a service allowing users to access infrastructure technology enabled services from the Internet without knowledge of, or control over the technologies behind these servers.

Cloud computing is rapidly turning into a successful and effective method for figuring assets. Bring together the management of assets and management Cloud computing conveys facilitated administrations over the Internet. Cloud computing can give the most practical and vitality effective method for processing assets administration. Cloud computing transform's data innovation into common wares and utilities by utilizing the pay-per-use evaluating model. The supplier rents assets from the unique sellers for the best suitable multi server clients. The clouds provide resources for jobs in the form of virtual machine (VM). In addition, the users submit their jobs to the cloud in which a job queuing system such as SGE PBS or condor is used.

6.2 QUEUING MODEL

We consider the cloud service platform as a multiserver system with a service request queue. The clouds provide resources for jobs in the form of virtual machine (VM). In addition, the users submit their jobs to the cloud in which a job queuing system such as SGE PBS, or condor is used. All jobs are scheduled by the job scheduler and assigned to different VMs in a centralized way. Hence, we can consider it as a service request queue. Condor is a specialized workload management system for compute intensive jobs and it provides a job queuing Mechanism, scheduling policy, priority scheme, resource monitoring, and resource management as an illustration. Users submit their jobs to server and servers places them into a queue, chooses when and where to run them depending upon a policy. An M/M/m+D queuing model is built for our multiserver system with varying system size. Many factors are taken into account, such as the demand of market, the requests workload, the server-level agreement, the servers rental cost , the energy consumption cost, and so forth for the optimal configuration of profit maximization . The optimal solutions are solved for two different situations, which are the ideal optimal solutions and the actual optimal solutions.

6.3 BUSINESS SERVICE PROVIDER

Infrastructure service providers are paid for by cloud service providers for renting their physical resources and charge customers for processing their service requests which generates cost and revenue, respectively. The profit is generated from the gap between the revenue and the cost. In this module the service providers considered as cloud brokers because they can play an important role in between cloud customers and infrastructure providers ,and he can establish an indirect connection between cloud customer and infrastructure providers.

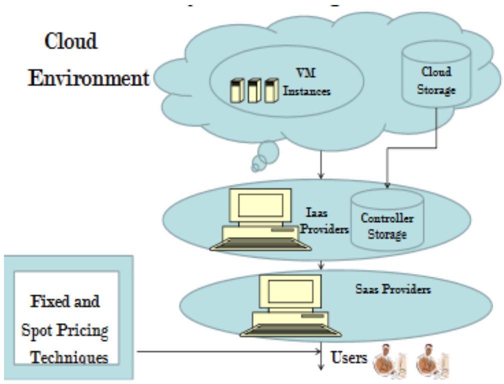


Fig.3 Architecture of BSP

A SaaS provider rents resources from IaaS providers and leases software as services to users. Software as a Service provider's objective is to minimize their cost of operation by efficiently using resources.

Satisfaction Level by satisfying SLAs, which are used to assure QoS requirements of accepted users. In Software service provider's view, there are two layers of SLA with both users and resource providers. SLA with user can help the SaaS provider to improve the customer satisfaction level by gaining usersrust on the quality of service so it is important to establish two SLA layers. SLA with service providers can implement service providers to deliver the satisfied service. SLA with resource providers can enforce resource providers to deliver the satisfied service. If any party in the contract violates its terms, the defaulter has to pay for the fine according to the clauses defined in the SLA.

6.4 INFRASTRUCTURE SERVICE PROVIDER

In the three-tier structure, an infrastructure provider the basic hardware and software facilities. A service provider rents resources from infrastructure providers and prepares, a set of services in the form of virtual machine (VM). Long term renting and short term renting are the two kinds of resources provided by infrastructure providers. In general, the rental price of long term renting is much cheaper than that of short term renting. Infrastructure provider provides virtual machines to Software service providers and is charge for settling VM images to run on their physical resources. The platform layer of Software as a service provider uses Virtual Machine images to create instances. It is important to establish SLA with a resource provider because it enforces the resource provider to guarantee service quality. Additionally, it provides a risk transfer for software as service providers, when the terms are violated by resource provider. In an actual cloud computing platform such as Amazon EC2, IBM blue cloud, and private clouds, there are many work nodes managed by the cloud managers such as Eucalyptus, Open Nebula, and Nimbus.

The clouds provide resources for jobs in the form of virtual machine (VM). In addition, the users submit their jobs to the cloud in which a job queuing system such as SGE, PBS, or Condor is used. In the most basic cloud service model - and according to the Internet Engineering Task Force - providers of infrastructure service providers offer computers – physical or (more often) virtual machines – and other resources. Cloud infrastructure like physical computing resources location, data partitioning, scaling, security backup etc. are provided to users by infrastructure service providers. Users and the providers negotiate for the service that is they have an agreement between them. After having their agreement, resources will be provided to users with the help of the Service Level Agreement contract. If the request can be accepted, a formal service level agreement is signed between parties to assure the QoS requirements such as response time.

6.5 CLOUD CUSTOMERS

A customer submits a service request to a service provider which delivers services on demand. The customer receives the desired result from the service provider with certain service-level agreement, and pays for the service based on the amount of the service and the service quality. The customer rent the two types of renting scheme viz long term and short term renting. The revenue model is determined by the pricing strategy and the server-level agreement (SLA). In this paper, the usage-based pricing strategy is adopted, since cloud computing provides services to customers and charges them on demand. Because of the limited servers, the service requests that cannot be handled immediately after entering the system must wait in the queue until any server is available. However, to satisfy the quality-of-service requirements, the waiting time of each service request should be limited within a certain range which is determined by the SLA.

6.6 DOUBLE QUALITY GUARANTEED RENTING SCHEME

Quality of service requirements under various configurations and profit maximization, reducing wastage of resources is done by combining long term and short term renting scheme. The Double Quality Guaranteed resource renting scheme uses both long term renting and short term renting. The main computing capacity is provided by the long-term rented servers due to their low price. The short-term rented servers provide the extra capacity in peak period. The requests are assigned and executed on the long-term rented servers in the order of arrival times.

Double-Quality-Guaranteed (DQG) Scheme Algorithm:

1) A multiserver system with m servers is running and waiting for the events as follows
2) A queue Q is initialized as empty
3) Event – A service request arrives
4) Search if any server is available
5) if true then
6) Assign the service request to one available server
7) else
8) Put it at the end of queue Q and record its waiting time
9) end if
10) End Event
11) Event – A server becomes idle
12) Search if the queue Q is empty
13) if true then
14) Wait for a new service request
15) else
16) Take the first service request from queue Q and assign it to the idle server
17) end if
18) End Event
19) Event – The deadline of a request is achieved

7. RESULTS

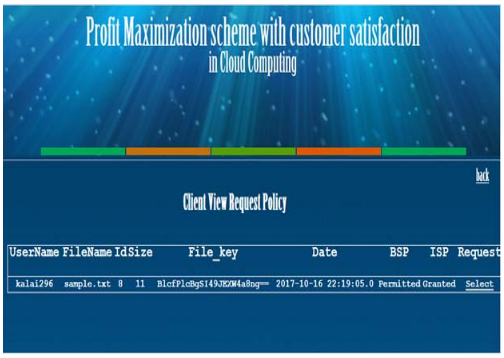


Fig 6.1 Client raises request to business service provider for a new cloud service

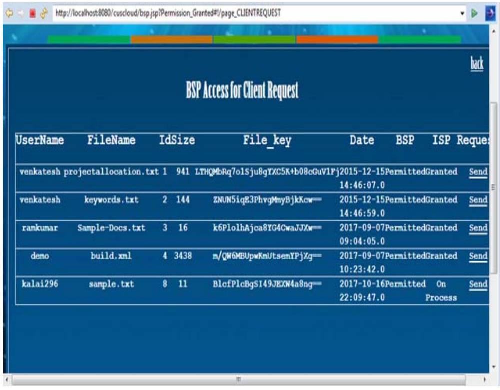


Fig 6.2 Business Service Provider's view where he manages client's request and verifies Infrastructure service provider permission status

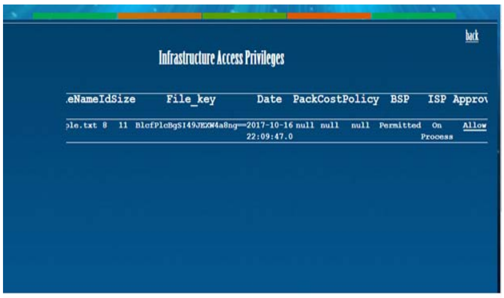
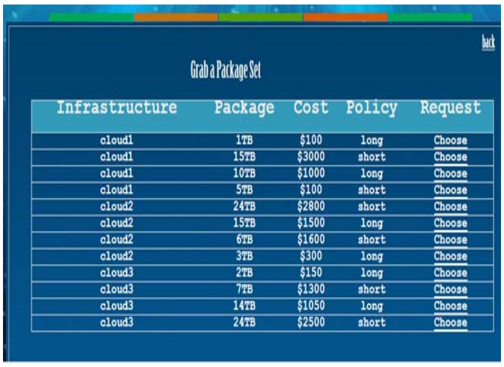


Fig 6.3 Infrastructure Service provider's view where he gives access and allocates space for business service provider

Fig 6.4 Business Service Provider view after giving approval for client's request



Infrastructure	Package	Cost	Policy	Request
cloud1	1TB	$100	long	Choose
cloud1	15TB	$3000	short	Choose
cloud1	10TB	$1000	long	Choose
cloud1	5TB	$100	short	Choose
cloud2	24TB	$2800	short	Choose
cloud2	15TB	$1500	long	Choose
cloud2	6TB	$1600	short	Choose
cloud2	3TB	$300	long	Choose
cloud3	2TB	$150	long	Choose
cloud3	7TB	$1300	short	Choose
cloud3	14TB	$1050	long	Choose
cloud3	24TB	$2500	short	Choose

Fig 6.5 Client where he can select the package which he is most suitable with from BSP

Fig 6.6 Infrastructure Service Provider where he allocates the infrastructure to BSP

8. CONCLUSION AND FUTURE WORK

To assure the quality of service requests and maximize the profit of cloud service providers, this paper has proposed a novel Double Quality Guaranteed renting scheme for service providers. This scheme combines both short term renting and long term renting, which can reduce the resource waste greatly and adapt to the dynamical demand of computing capacity. An M/M/m+Dqueueing model is built for our multiserver system with varying system size.

And then, an optimal configuration problem of profit maximization is formulated in which many factors are taken into considerations, such as the market demand, the workload of requests, the server-level agreement, the rental cost of servers, the cost of energy consumption, and so forth.

The optimal solutions are solved for two different situations, which are the ideal optimal solutions and the actual optimal solutions. Even more, a series of calculations are conducted to compare the profit obtained by the DQG renting scheme with the Single Quality Unguaranteed renting scheme. The results show that our scheme outperforms the SQU scheme in terms of both of service quality and profit.

Comparing the profits obtained from DQG and SQG schemes. Measuring quality of service (QOS) and plotting the graphs for both DQG and SQG. Improving the user interface, by having graphs for profit and time taken for handling service request. Profit maximization problem in a heterogeneous cloud environment.

REFERENCES

[1] P. Mell and T. Grance, “The NIST definition of cloud computing,”Commun. ACM, vol. 53, no. 6, pp. 50–50, 2011.

[2] J. Cao, K. Hwang, K. Li, and A. Y. Zomaya, “Optimal multiserver configuration for profit maximization in cloud computing,”IEEE Trans. Parallel Distrib. Syst., vol. 24, no. 6, pp. 1087–1096, Jun. 2013.

[3] N. Putin, “An experimental study of customer effort, expectation, and satisfaction,”J. Marketing Res., vol. 2, pp. 244–249, 1965.

[4] J. A. Howard and J. N. Sheth,The Theory of Buyer Behavior, vol. 14.New York, NY, USA: Wiley, 1969.

[5] G. A. Churchill Jr and C. Surprenant, “An investigation into the determinants of customer satisfaction,”J. Marketing Res., vol. 19, pp. 491–504, 1982.

[6] D. K. Tse and P. C. Wilton, “Models of consumer satisfaction for-mation: An extension,”J. Marketing Res., vol. 25, pp. 204–212, 1988.

a. Parasuraman, V. A. Zeithaml, and L. L. Berry, “Reassessment of expectations as a comparison standard in measuring servicequality: Implications for further research,”J. Marketing, vol. 58, pp. 111–124, 1994.

[7] K. Medigovich, D. Porock, L. Kristjanson, and M. Smith,“Predictors of family satisfaction.[9] J. J. Jiang, G. Klein, and C. Saunders, Discrepancy Theory Models of Satisfaction in IS Research,New York, NY, USA: Springer, 2012,pp. 355–381.

[8] J. Chen, C. Wang, B. B. Zhou, L. Sun, Y. C. Lee, and A. Y. Zomaya,“Tradeoffs between profit and customer satisfaction for service provisioning in the cloud,” in Proc. 20th Int. Symp. High Performance Distrib. compute. 2011, pp. 229–238.

[9] R. Chen, Y. Zhang, and D. Zhang, “A cloud task scheduling algorithm based on users' satisfaction,” in Proc. 4th Int. Conf. Netw Distrib. Comput., Dec. 2013, pp. 1–5.

[10] M. Unuvar, S. Tosi, Y. Doganata, M. Steinder, and A. Tantawi,“Selecting optimum cloud availability zones by learning user satisfaction levels,” IEEE Trans. Serv. Computer, vol. 8, no. 2, pp. 199–211, Mar./Apr. 2015.

[11] Yolanda Gil and Jim Blythe. "PLANET: AShareable and Reusable Ontology for Representing Plans". In AAAI 2000 workshop on Representational Issues for Real-world Planning Systems, Proceedings of the International Conference on Intelligent User Interfaces, 2001

[12] Tom Russ, Robert MacGregor, and William Swartout. "Building, Using and Reusing Ontology of Air Campaign Planning".IEEE Intelligent Systems, special issue on Ontologies, 14(1), January 1999.

[13] Jim Blythe and Yolanda Gil. "A Problem- Solving Method for Plan Evaluation and Critiquing". Proceedings of the Twelfth Banff Knowledge Acquisition for Knowledge-Based Systems Workshop.

[14] Xing Jiang and Ah-Hwee Tan, “Mining Ontological Knowledge from Domain-Specific Text Documents”, International Journal of Human-Computer Studies, 1998. International

Journal of Human-Computer Studies, 1998

[15] Dr.M.Aramudhan,“A technique to user profiling ontology mining and relationship ranking”, Journal of Theoretical and Applied Information Technology,31stDecember 2013. Vol. 58 No.3

[16] G.S.AnandhaMala,G.Divya, “Enhancing the digital data retrieval system using novel techniques”, Journal of Theoretical and Applied Information Technology, 20th August 2014. Vol. 66 No.2

[17] Vanitha Muthuswamy,Kavitha.C, “Secureddata deletion in cloud based multi-tenent databased architecture”,International Journal on information Sciences and Computing “, Vol 6, No 2,July 2012.

[18] Mart Posonia Context based Classification of XML Documents in Feature Clustering, Indian Journal of Science and Technology, 2014, 7(9): 1355–1358

[19] S.Vigneshwari, Aramudhan M, An approach to personalize the web using XML based ontologies, 2012, 2012 World Congress on Information and Communication Technologies, 759-762.