Enhancing Provider's Profit on Cloud Market Infrastructure

Gaurav Mishra
Department of CSE &IT
MITS
Gwalior(M.P.), India

Rajni Ranjan Singh
Department of CSE &IT
MITS
Gwalior(M.P.), India

Abstract: Cloud infrastructure and platform services of the cloud are progressively getting to be plainly well known everywhere throughout the world, however, resource scheduling and allocation of multiple virtual machines on cloudsare still a difficult taskto attain. Streamlining of these issues can be useful in enhancing the vitality savings and load adjusting in substantial datacenters.Since the request of assets from client fluctuates with time,therefore, the load on cloudgenerally remains low during normal hours and remains high during peak hours.A solitary cloud service provider might not have obliged assets to satisfy client's solicitations amid the pinnacle hour and on contrary, there may be some providerswith under-utilized resources. These difficulties can be overcome by using cloud federation which allows outsourcing at peak time i.e.,underutilized providers can rent their resources to different IaaS(Infrastructure as a service) providers. Resource allocation and scheduling also have animpact in federated clouds, assets can be purchased from different individuals of cloud federation. Existing practices cloud confederation and resource management are a bit intricate, which makes them less dynamic in nature and in some cases decreases the revenue and profit of cloud service provider. A prototype of new method for cloud confederation has expounded which focuses to enhance the gain for cloud service provider. Our parameters include free assets to be sold, a number of outsourced resources, the fare of maintaining servers, the fare of third party resources, and workload.

Keywords:cloud provider; cloud computing; datacenter; federation; outsourcing; gain

I. INTRODUCTION

Cloud has made a noteworthycontribution in the area of business, scholastics, and experimentation. Nowadays, almost everyweb application, starting from e-commerce to social networking, has started to shift their business to the cloud. However, with this exponential increment in the exercise of cloud computing,many problems have also become relevant such as resource limit, better management of resources (resource allocation),virtual machine instance creation, VM destruction, etc. All these problems require multi-faceted approach for their solutions likejob scheduling, security, VM provisioning, load balancing, resource management, virtualization, etc.It is evident that with this quick development in use of cloud computing,a solitary cloud service provider would not have the ability to arrangement every one of the solicitations alone. Similarly, there can be a situation in which a cloudmayhave many of its resources underutilized. To root out the aforesaid limitations, proposition of cloud federation was concocted. With this paradigm, a new method that dealswith the resource managementis required. The goal of this paper is to provide a set of approaches for the federated cloud environment along with improving the cloud service provider's profit.

The major cloud platforms in cloud computing disciplineareAmazon Web Services [1], Google AppEngine [2], Microsoft Azure [3], and GoGrid.These offer numerous sort of utilities for watching, overseeing, provisioning of assets, and application utilities. All the above-expressed goliath cloud providers are really made out of numerous little cloudproviders. Theseclouds enable collaborative work via sharing of computational and storage resources. All such collaborations are known as cloud federation.

Cloud computing hascontributed in various sciences and engineering disciplines. Current clouds remain isolated and do not exploit the resources of different cloud providers to fulfill the user's request.This condition does not fit with the first vision of Cloud computing which imagined a single global infrastructure. To address this issue, there should be interoperability among several cloud providers, to concede simple access starting with one cloud then onto the next.

However, this interoperability effort which aims toenable the sharing of resources between clouds still remains a challenging issue. The proposed method discusses the operations on different parameters that can be applied to manage asset exploitation and increase the provider's gain in cloud alliance condition. Present work providesthe results for all the four distinctscheme of resource utilizationand concludes the implementation of the proposed method in order to attain the utmost gain.

II. RELATED WORK

Principal ideas of cloud computing described as in [1–5] explain the architecture of cloud, service models and its characteristics, resource allocation, cloud federation, virtualization, and security.

Customer requirements vary from time to time and single cloud provider has not possessed the capacity to satisfy them.At the point when the quantity of client entreaty increase, then a solitary cloud supplier does not work productively to fulfill the client necessityDue to which there is a need to develop new resource allocation method, which shares the common resource of multiple clouds as in [6] and [7]. Therefore, Grid computing idea comes in the picture which provides the extreme utilization. The design of cloud

confederation was introduced first time in reservoir project as in [8]. In this venture, scribbler illuminated the challenges that emerge while intermingling the clouds with various platforms and APIs. Butthe venture did not propose any technique to choose when a cloud service provider needs to transfer tasks to another provider. Reference [9-11]show thatfinancial model of outsourcing in cloud combined condition is utilized to pick the most advantageous choice relying upon environ condition.

Till now, the greater part of the work has been done in solitary cloud service provider but territory of multitudinous clouds is still open, so virtual machine provisioning [12] in multitudinous cloudsgives the assurance to amplify the usage and productively circulate the whole asset to the client as in [13]. Reference [14] show the method of simulation and modeling of cloud computing.

III. ANATOMY

A. Cloud Provider

Cloud provider sporadically gaze at datacenter, exchange it to next datacenter with the goal that heap adjusting can be accomplished. It controls the cloud and recognizes the customer's necessities to arrange the course of action on assets as indicated by the request as in [15]. This substance helps the cloud trafficker in administrative portion.

B. Cloud Facilitator

The cloud facilitator service is in charge of the management of domain specific enterprise clouds and their membership to the overall confederation driven by market-based trading and conciliation protocols. It provides a programming, man-agreement, and deployment environment for applications in alliance of Cloud service provider as in [16].

C. Cloud Trafficker

The Cloud trafficker substance helps clients to discover suitable Cloud service provider through the Cloud Trade and counsel with Cloud Facilitators element for a planning of assets that addresses QoS issues of clients.
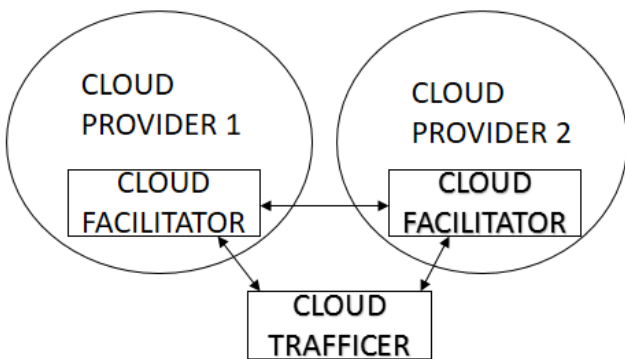

Figure 1: Scheme Facsimile

IV. PROPOSED METHOD

Present work deals with a new method which focuses on the expansion in accessibility of assets to clienteles and furthermore increases the gain of cloud service providers. In this method, when a clientele solicitation comes to a specified cloud service provider, the cloud first initially looks its own particular server in the event that it has resources to satisfy the demand and afterward apportions the resource. Otherwise, it approaches another cloud service provider by utilizing the mutual part between them as delineates in figure 1.
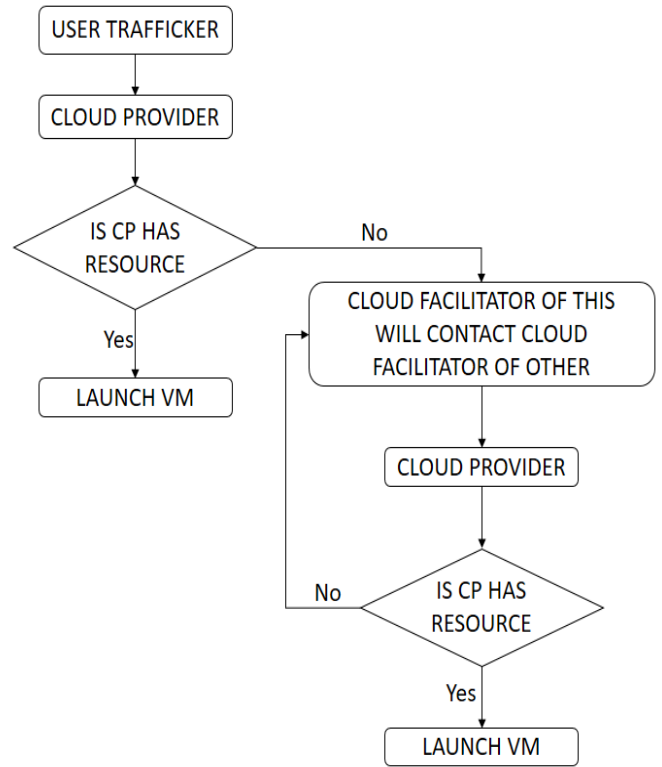

Figure 2: Basic flow diagram

Four scenarios are possible as in [7]:-

A. Allocation within the provider

In this policy, cloud service provider has adequate assets to satisfy the entire user request or on the other hand,cloud provider doesn't sell or purchase its resource to other cloud providers. Otherwise, it rejects the user request. In this case, revenue is generated only by selling its resources to the customer. This arrangement is considered as a basic strategy to permit confirmation of extreme profit that a service provider can make in the absence of alliance and the cost can be defined as a fixed cost to manage all datacenters.

$$\text{Profit (t)} = \text{Revenue (t)} - \text{Cost (t)} \quad (1)$$

$$\text{Revenue (t)} = (\text{VM\_price}) / \text{hour} * \text{total no. of VM} * \text{T} \quad (2)$$
Where R represents Revenue and VM is a virtual machine and
$$\text{Cost (t)} = (\text{no. of VM required to complete a request}) * (\text{manage cost per hour}) * \text{T} \quad (3)$$

Where Revenue (t) and Cost (t) are the revenue and cost at particular time T, respectively.

B. *Insourcing*

When the cloud provider has underused resources, in that case, the provider has two choices, first is to sell his own resources to another cloud provider even at a lower price, and secondlyisclosed downits own free datacenter. The second case is not profitable from provider's point of viewbecause it works as an NPA (Non-profitable asset). It also creates the problem as the cloud provider spends ahuge amount of capital to establishthe datacenter.

$$Revenue\_in(t) = VM\_free * VM\_price / hour * T * Y \quad (4)$$

Where

$$VM\_free =$$

(no of virtual machine – utilization)$Revenuet\_total(t) =$

$$Revenue(t) + Revenue\_in(t) \quad (5)$$

Profit (t), Revenue (t) and Cost (t) can be calculated from equations (1)(2) and (3) respectively.

C. *Outsourcing*

In this case when cloud provider has been fully loaded it has two choices, first isto reject all the new user requests until the resources become free, and second is to take in use the resourcesfrom other cloud providers on an agreement. In the event that service provider refuses a request,it implies loss of cash as well as credit as well.In this case,service provider does not manage any extra data center itonly increases the revenue.

$$Cost\_total (t) = Cost (t) + Cost\_out (t) \quad (6)$$

Where Cost_out(t) is the cost to manage the rented free datacenter.
$$Cost\_out(t) = \sum_{i=0}^{VMout} Priceout * X \quad (7)$$

Therefore, outsourcing is beneficial as it provides profit with the increase in revenue as compared to the increased cost

Profit(t), Revenue(t) and Cost(t) can be calculated from the equations (1)(2) and (3) respectively.

D *Combined scenario*

For this situation, the service providers are permitted to utilize both (Insourcing & Outsourcing) in the meantime.The income generated is the sum of revenue generated in joined scenario. The cost is same as on account of outsourcing as in [7]

Cost_total(t), Revenuet_total(t), can be calculated from equations (6) and (5) respectively.

Here X in equation (7) and Y in equation (4) depicts that a cloud provider rents his resource to other providers at alesser price than a normal user and value of X and Y relies on the agreement matrix among the cloud service providers.

IV. EVALUATION

The prototype presented isdesigned using JAVA as a platform as in [14].This simulation experiment has evaluatedthe equations to discover the impact of a few parameters in the service provider's gain. These parameters incorporate free assets to be sold, a number of rented assets, the fare of looking after servers, the fare ofthird party resources, and workload as in [7].In this experiment, 4 cloud providers are takenand 5 VMs (1000 MIPS) per node, 40 hosts are used, assuming small instances.This is because midrange servers like EC2 support maximum 6 VMs per node. The unit of input is MI (Million Instructions), deadline is 3 second.

With the different value of contract matrix

[Cij]={
$\{a_{11},a_{12},a_{13},a_{14}\},\{a_{21},a_{22},a_{23},a_{24}\},\{a_{31},a_{32},a_{33},a_{34}\},\{a_{41},a_{42},a_{43},a_{44}\}$
}experiments are performedand results are evaluated. Contract matrix (Cij) values depend on the agreement of shared resource betweenthem. Matrix values (a_{ij}) help in calculating revenue and cost of different cloud providers.The revenue multiplied by Cij get to provider 'i', if the i[th]provider uses the resources of j[th] provider as in [7]. For the first experiment, the values of contract matrix are given below:-

Contract matrix [Cij]={ {1,0.3,0.8,0.6}, {0.7, 1,0.2,0.9}, {0.2,0.8, 1,0.5}, {0.4,0.1,0.5,1} }

Results for this are shown in Table 1.

V. RESULTS

Table 1: Profit table for distinct workload

MI \ CASE	20000	30000	40000	50000	60000
Insourcing	b+14	b+41	b+77	b+140	b+176
Outsourcing	b+38	b+101	b+185	b+211	b+266
Federated	b+56	b+146	b+266	b+356	b+446

In Table 1,2 and 3 revenue and profit values area and b respectively, for the allocation within the providers show that if a cloud provider is fully loaded, it rejects the entire user request until it becomes free

It is perceptible in table 1, proposed strategy is delicate to the quantity of demand. The benefit rate increments up to 40000 mi. Benefit rate diminishes gradually after 40000 mi, in light of the fact that disposed of solicitations has expanded. Consequently in the mode of 40000 mi, state's great degree beneficial.

Table 2: Simulation Results for Revenue and Profit

CASE	Revenue	Profit
Allocation within the provider	a	b

Insourcing	a+18	b+14
Outsourcing	a+42	b+38
Both insourcing and outsourcing	a+60	b+56

This experiment also considers one special case in which all the values of the matrix are 0.5 which shows the equal amount distributed betweencloud providers in the case of insourcing and outsourcing as in [7].

Contract matrix can be seen below:-
Contract[Cij]={{1,0.5,0.5,0.5},{0.5,1,0.5,0.5},{0.5,0.5,1,0.5}, {0.5,0.5,0.5,1} }

Table 3: Simulation Results for Revenue and Profit

CASE	Revenue	Profit
Allocation within the provider	a	b
Insourcing	a+30	b+26
Outsourcing	a+30	b+26
Both in sourcing and outsourcing	a+60	b+56

Result comparison-

In the mode of 20000mi as input with the deadline of 3 second, revenue and profit is more than the past strategy as in [7].

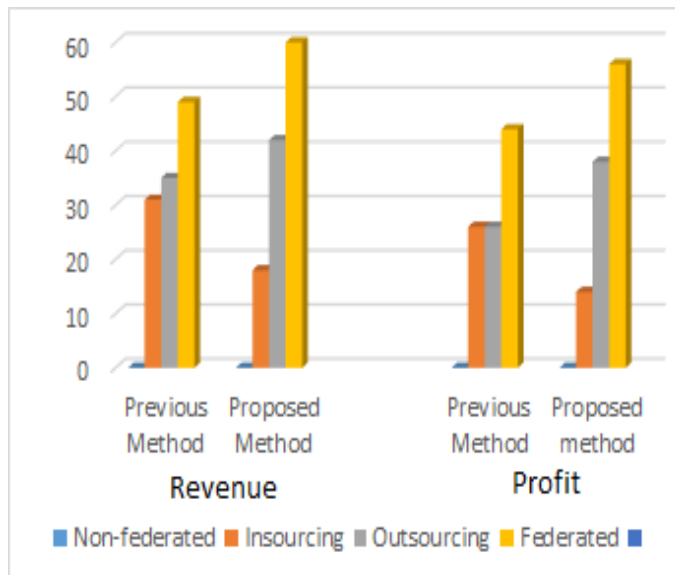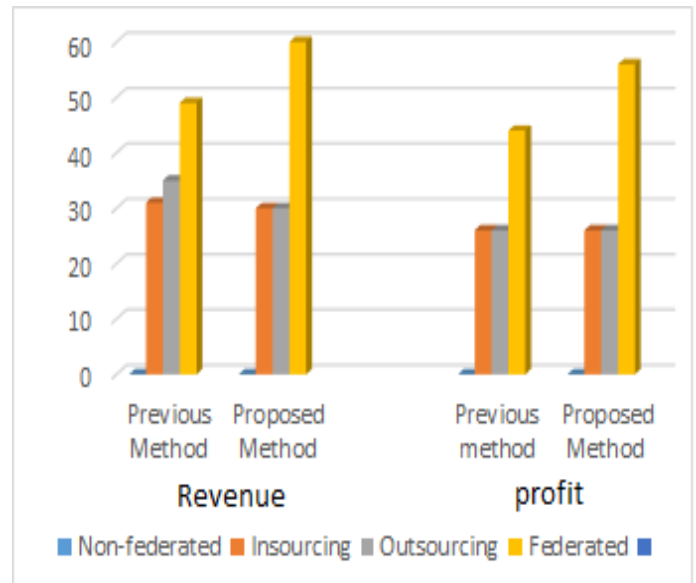Figure 3:The collation of revenue and gain between past strategy [7] and proposed technique for table 2

Figure4: The collation of revenue and gain between past strategy [7] and proposed technique for table 3

By the proposed technique, income increments by 22.45% and benefit by 27.27% in the joined situation of insourcing and outsourcing as in figure 1 and figure 2

VI. CONCLUSION AND FUTURE WORK

In this paper, another technique is demonstrated that arrangements with the procedure to distribute the assets to virtual machines, so as to enhance the gain in cloud alliance condition. Moreover, it provides insightsinto a few equations which help in ascertaining the income and profit on account of outsourcing, insourcing, and both (outsourcing and insourcing)

In this arresting subject of cloud, we will attempt to assess the acquired outcomes in genuine cloud situations and from that point, we will propound VM provisioning plans that will be established on QoS (Quality of Services) necessity, specified by the client.

VII. REFERENCES

[1] Cloud, https://en.wikipedia.org/wiki/Cloud_computing

[2] Windows Azure Platform, http://microsoft.com/azure

[3] Google App Engine, http://appengine.google.com

[4] Amazon Elastic Compute Cloud, http://aws.amazon.com'ec2

[5] Vmware, http://www.vmware.com/virtualization

[6] Behnam Bagheri Ghavam Abadi, Mostafa Ghobaei Arni : Resource management of iaas providers in cloud federation. International Journal Of Grid Computing Vol. 8 No. 5 (2015) pp 327-336

[7] K. S. Patel and A. K. Sarje. "VM provisioning policies to improve the profit of cloud infrastructure service providers", Computing Communication & Networking Technologies (ICCCNT), 2012 Third International Conference on, (2012), pp. 1-5.

[8] B. Rochwerger, D. Breitgand, E. Levy, A. Galis, K. Nagin, I. M. Llorente, R. Montero, Y. Wolfsthal, E. Elmroth, J.Caceres, M. Ben- Yehuda, W. Emmerich, and F. Galan, "The Reservoir model and architecture for open

federated Cloud computing," IBM Journal of Research and Development, vol. 53, no. 4, pp. 1–11, Jul. 2009

[9] A. k. Das, T. Adhikari, M. A. Razzaque, E. J. Cho, and C. S. Hong, "A QoS and profit aware cloud confederation model for IaaS service providers", Proceedings of the 8th International Conference on Ubiquitous Information Management and Communication, (2014), p. 42.

[10] Íñigo Goiri , Jordi Guitart, Jordi Torres," Economic model of a Cloud provider operating in a federated Cloud,"Published online: 17 September 2011© Springer Science+Business Media, LLC 2011

[11] M. Mihailescu and Y. M. Teo, "Dynamic resource pricing on federated Clouds," in IEEE International Symposium on Cluster Computing and the Grid. Los Alamitos, USA: IEEE Computer Society, 2010, pp. 513–517

[12] A. Kertesz, J. D. Dombi, and A. Benyi. "A Pliant –based Virtual Machine Scheduling Solution to Improve the Energy Efficiency of IaaS Clouds", Journal of Grid computing , (2015), pp.1-13

[13] Borja Sotomayor, Kate Keahey, Ian Foster, and Tim Freeman, "Enabling cost-effective resource leases with virtual machines," ACM/IEEE International on High Performance Distributed Computing 2007 (HPDC 2007), 2007.

[14] R. N. Calheiros, R. Ranjan, A. Beloglazov, C. A. F. D. Rose, and R. Buyya, "CloudSim: A toolkit for modeling and simulation of Cloud computing environments and evaluation of resource provisioning algorithms,"Software: Practice and Experience, vol. 41, no. 1, pp. 23–50, Jan. 2011.

[15] R. Buyya, C. S. Yeo, S. Venugopal, J. Broberg, and I. Brandic, "Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility," Future Generation Computer Systems, vol. 25, no. 6, pp. 599–616, 2009.

[16] R. Buyya, R. Ranjan, and R. N. Calheiros, "InterCloud: Utility-oriented federation of Cloud computing environments for scaling of application services," in Proceedings of the 10th International Conference on Algorithms and Architectures for Parallel Processing (ICA3PP'10), ser. Lecture Notes in Computer Science, vol. 6081. Busan: Springer, May 2010, pp. 13–31