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Pricing schemes in cloud computing:a review

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Abstract
Cloud computing is a promising technology in the present day, which offers utility computing services to the end users. The various services (SaaS, PaaS, and IaaS) are accessed through on-demand by the end users. There are several service provider companies that exist in the present market, this cause, a huge competition on pricing in the global market. The service provider uses various pricing models to determine the price, but most favorable pricing is a major challenge in cloud computing that maximize revenue for the provider and increase the quality of services for end users with reasonable pricing charge. The paper focuses on the comparison of various pricing schemes based on features, fairness, merits, demerits and discussion of service model, deployment model and major issues in cloud computing. This helps us to understand which approach should be used for future enhancement in pricing approach in cloud computing.

Keywords
Cloud computing, Pricing models, Pricing schemes, Dynamic pricing, Static pricing.

1.Introduction
Cloud is a group of hardware, network, interface and storage that enable the delivery of computing as a service. Cloud services consist, delivery of infrastructure, software and storage over the network based on user demand. NIST defines cloud computing as follows: ”cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. Networks, servers, storage, applications and services) that can rapidly provision and released with minimal management effort or service provider interaction”[1]. Cloud services setup multi-tenancy. The cloud services like social networking (Facebook or Twitter) and collaboration tools (audio, video conferencing tools and webinar, etc.) are changing the method of people in accessing of business, providing and understanding information. The service provider in cloud model still works on the infrastructure in its own facilities. Irrespective of this, we are unaware about where computing resources, application or even data exist. Based on scale the service provider designs their infrastructure. The cloud provider provides the services to the customer based on demands.

This cloud service includes the infrastructure as a service (IaaS), platform as a service (PaaS), software as a service (SaaS), storage as a service (STaaS), security as a service (SECaaS), and many more [2]. Therefore, this service provides to the customer with pricing schemes. The pricing schemes are the important factor for the cloud provider for offerings the services or products. The pricing schemes must be satisfactory for both parties include users and providers. The main goal for cloud providers to achieve maximum revenue with pricing schemes and for users to achieve the highest level of quality of services which is affordable in reasonable price. Therefore, the prices are charged are the critical factoring for the companies to offerings the product [3]. Cloud provider used the various pricing schemes to specify the price. Pricing schemes affects the user’s demand, behaviors, utilization, organization success and many more.

The rest of the paper is categorized into five sections. Section 2 discusses the deployment model, service model of the cloud computing and the major issues of cloud computing. In section 3, brief discusses about pricing models and cost structure. Section 4; demonstrate the various the pricing schemes and examples related to the pricing schemes in cloud computing. Finally, section 5 concludes the paper.

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2.Service models, deployment models and major issues in cloud computing

2.1Cloud service models

There are three service models identified in the cloud computing [1]. This includes SaaS, PaaS, and IaaS. The brief description of the model is as follows.

Software as a Service (SaaS): The capability serves to the users; it helps in using the provider's application that runs on a cloud infrastructure. The applications are run from different types of client devices via either a thin client interface, such as a web browser (e.g., Gmail), or a software interface.

Platform as a Service (PaaS): The capability is served to the user is to arrange onto the cloud infrastructure, consumer-created or obtained applications created by using programming languages, services, libraries and tools which supported by the provider.

Infrastructure as a Service (IaaS): The capability serves to the user is to give, storage, networks, processing and other basic computing resources where the user can deploy and run arbitrary programs, which can consist applications and applications.

2.2Deployment models

There are four deployment models including private cloud, public cloud, community cloud, and hybrid cloud [1]. A cloud infrastructure operates any one of the following deployment models.

Private cloud: This cloud infrastructure is provisioned for entire used by a single organization that serves multiple users for their service (e.g., business units). It might be own governed, operated and maintained by the organization, a single, or some combination of third party and it may lie on or off premises.

Community cloud: This cloud infrastructure is provisioned for entire use by a community of users from organizations which have common establishments (e.g., security requirements, policy, mission, and compliance considerations). It may be owned, governed, operated and maintain by single or combination of the organizations in the community, a third party or the combination of third party, and it may be obtained on or off premises.

Public cloud: This cloud infrastructure is provisioned openly using by the common public. It may be own governed, operated and maintained by government organization, business, academic, or some combination of them. It is obtained on the premises of the cloud provider.

Hybrid cloud: This cloud infrastructure is a combination of two or more different cloud infrastructures (public, private or community) that left unique entities, but they are bound together with standardized or aid technology that invokes application and data portability (e.g., cloud bursting for load balancing between the clouds). The *Figure 1* given below show the service and deployment model of cloud computing.

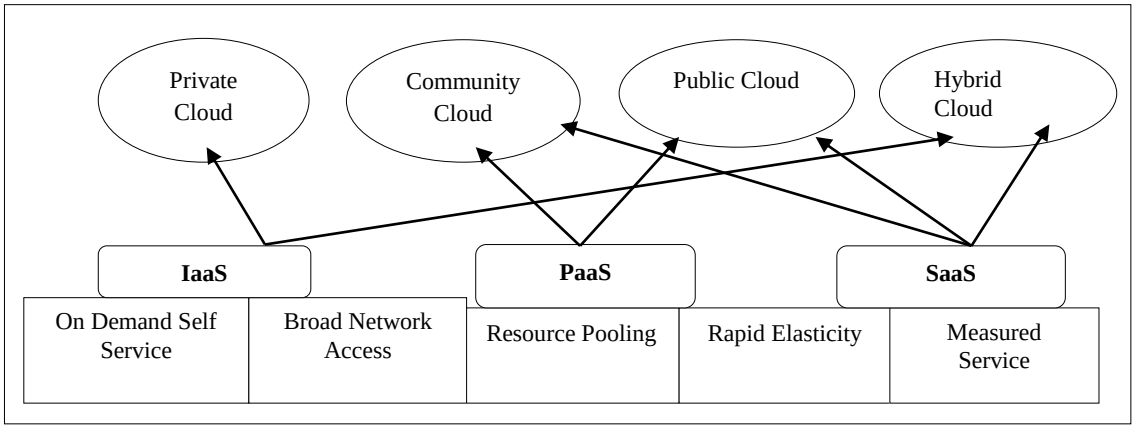

Figure 1 Service and deployment model of cloud computing

2.3Major research issues in cloud computing

In cloud computing, cloud services are span all over the world instead of it there are major research issues in cloud computing. The cloud computing in real time scenario has, followed by various issues. Some of them are discussed below.

Availability It is the major concerned issue in which three major factors include data, security and performance that's comes in the way of availability [4]. To provide cloud services, mainly SaaS, having numerous of users. This caused the difficulty in the provision of the services to the customer by the organizations. Therefore, distributed-denial-of-services occurred in cloud computing. To overcome this problem, federated cloud computing are being used to provide the services to the users.

Data security It is one of the critical issues in cloud computing. Because user has not any control over the underlying infrastructure of cloud computing. This cause the user depends on the cloud service provider for their whole data which is stored in the cloud [5, 6]. According to the user's point of view, reliability and audibility are the major concern for them. So it must be securely based on security and role mechanism which is necessary for each level of architecture.

Data lock in: It is critical issues in cloud computing as mentioned in [4, 6]. It causes the difficulty for the users to extract the data from any location and move to another location. Therefore, users must depend on the same service provider for the services and accept the prices fixed by the provider. The main cause of this problem is the unavailability of standard application programming interface (API).

Pricing models: In order to overcome the problem of data-lock-in, the cloud providers are tending to improve the standard of API. This caused the price wars among the service provider for a similar set of services. Therefore, the providers find the difficulty for sustaining in the competitive market for pricing of services. To avoid this problem there must be efficient pricing model to satisfy both parties include customer and providers. So the arising of the efficient pricing model must be considered about certain factor, including the fairness, competition, dynamic nature of cloud and much more. Pricing of services in the cloud is the emerging research issues in cloud computing.

There is certainly other performance issue in cloud computing, such as performance unpredictability, virtual machine migration and much more [4, 7]. The pricing model has been discussed in the next section.

3.Pricing models

As increases the numbers of cloud providers for provisioning of services to the customer. This causes the difficulty to determine the correct prices for cloud providers. It is a critical situation for cloud providers to decide the price charging. Because the supply and demand in cloud could be regulated by the pricing criteria and affects the both parties include providers and users [8].

3.1Classification of pricing models

The strategy of pricing can be categorized into two common pricing models such as fixed pricing model and dynamic pricing model.

Static or fixed pricing model: In this model, price charging cannot change for the long term. The prices of a variety of resources are determined by the cloud provider in prior. Fixed pricing contains the pay per use pricing and subscription pricing [9]. Fixed pricing is more straightforward and simple to sense, but it would not be done fair to all users, because it is not necessary, that all users have similar needs [10]. Static pricing also bounds the providers profit whenever the demand increases either decrease static price do not change over the time that causes the providers loss. This can be shown below, in the *Figure 2* [11].

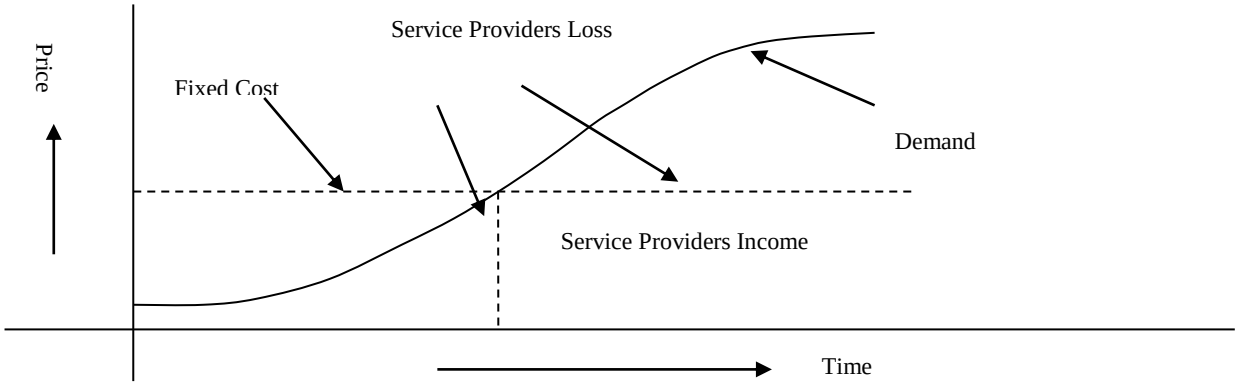

Figure 2 Static pricing limits service provider's profit

Dynamic pricing model: In this pricing strategy, prices are changing dynamically with respect to market condition or status. As the result of price change, because changing in the demand and supply [12]. The price of the cloud services can be calculated based on request of users which used the price mechanism. For example, "Amazon spot instances" which is introduced by Amazon web service. This allows for the users to bid for their remaining capacity [9]. *Table 1* shows the features, merits, demerits of pricing models which are given below.

Table 1 Static pricing VS dynamic pricing

Pricing model	Features	Merits	Demerits
Fixed pricing	It is also called static pricing, because it consistently for a longer time period.	It supports more assurance for customers.	It disallows changing the price with respect to time and cost.
	Users are aware how much they have	Simple to profit estimation.	Unfair with customer because all users have not same need.
Dynamic pricing	It is also called Real time pricing.	It allows maximizing revenue or profit.	It leads alienation in customer.
	Setting of cost of the services is very flexible because prices are varying with respect to time.	It adjusts the price with perspective of cost and time.	It needs more advance technology for adjusting price and profit calculation.

Both models have some merits and demerits, such that static model has done unfair to customers when the customer are not utilizing the resources as they pay. Sometime, due to fixed pricing criteria, unfair occurs with Providers when customers extremely used the resources. While as the dynamic pricing are adjusted with time and cost, but it need advance technology.

3.2Cost structure of cloud provider

The key issues are how price is accounted, measured in cloud and distributed among the different service layer and organizational unit is accountable for them. One method is used widely in outlining IT services of cost structure.

It is found in information technology infrastructure library version2 service delivery [9]. This ITIL suggests the six different types of cost which helps in budgeting and accounting. Cloud computing, including both variable cost elements and fixed cost elements. It is shown in *Table 2*.

Table 2 Cost types and cost elements according to ITIL

Cost type	Cost elements (Examples)
Hardware	Central processing units, LANs, disk storage, peripherals, wide area network, PCs, portables, local servers.
Software	Operating systems, scheduling tools, applications, databases, personal productivity tools, monitoring tools, analysis packages.
People	Payroll costs benefit cars, re-location costs, expenses, overtime, and consultancy.
Accommodation	Offices, storage, secure areas, utilities.
External service	Security services, disaster recovery services, outsourcing services, HR overhead.
Transfer	Internal charges from other cost centers within the organization.

There are several common factors which affect the prices of services in the cloud [13]. These are given as below.

Annual cost or investment: The cloud provider spends the money for buying the resources per year.

Contract time or lease period: The resources will be leased for a certain time to customers from cloud service providers. As, the lease time period is longer then price will decrease.

Level of resources or age of resources: It expressed the age of resources that would lease to customer in the period.

Quality of services (QoS): This factor identifies the as surety of quality from the provider to the users.

The key features of QoS include scalability, availability, security, privacy. An increment in the quality of the services causes increases the price per unit.

Rate of depreciation [13]: It expressed the rate at which the decrease the value cost of the hardware of the service provider.

Cost of maintenance: It illustrates that the cloud providers expense the money for maintenance and security of cloud. Some other aspect which affects the prices of the resources in the cloud computing. These are shown in *Table 3*.

Table 3 Some factors that affect the price of cloud resources

• Provider reputations	The reputation of cloud providers is must to enhance the trust among the community when it's well knowingly that may have sensitive data. Reputation measures reliability and important part of trust. So, reputation must well establish for business for business functions [14].
• Capital cost of Data centers	The price would be estimated from the data center, as the cost of installation charges include electricity costs, network connection, cooling resources, real states and etc.
• Users reputation	Reputation of users has special importance in a cloud in aspects of several attacks, Trojans and many more.
• User review	Public review on various issues, including data loss, downtime, password weakness, phishing, which can be worthwhile in pricing of cloud services [14].
• Monitoring services	Some service providers have the confidence to allow the monitoring tools to the customers for availability of services [14].
• Social category of customers	The fairness is in aspects of price with all users. So, it illustrates the social aspect of classification. The categorization must be on the basis of client location.
• Service level agreement (SLA)	It is compromising agreement between the cloud customers and providers for services. Cloud providers defined the various SLA in cloud [15].
• Type of co-cloud users	The multi-tenure nature of cloud which enhance to use the same cloud platform by the competing companies. The cloud price affected by the co-cloud information

4.Pricing schemes in cloud computing

On the basis of traditional pricing model of software, users would be pay once-off for unlimited usage. Since the modern involvement in software development from traditional approaches to SaaS, a new pricing approach has become important, taken into account of many new aspects for pricing. The pricing model in the cloud is more elastic than traditional approaches. Each service providers have it owns particular pricing scheme. For example, Salesforce used the "pay per use" schedule [16].

Amazon used the "pay-per-use fixed price" for example first 50 TB/month of storage used costs $0.150 per GB [17]. The evaluation is based on the amount of storage or speed of bandwidth (storage or bandwidth size). This approach is commonly used in PaaS and IaaS. Different service provider used different pricing scheme for provisioning of service to the end user. But the most employed model in cloud is pay-as-you go model. End user paid the fixed price as per unit of use. Amazon is the market leader in the cloud market, adapts such a model by taking a fixed price of virtual machine for each hour of usage [18, 19]. This model is also used by other service enterprises such as Google App Engine [20] and Windows Azure [21]. Another common scheme used by the service provider is the "pay for resources" model. The end user usually paid for the amount of bandwidth or storage consume. Subscription is also common, where the end user paid in advance for the services they are going to take for a pre-defined period of time.

Many useful theoretical studies of pricing scheme in cloud computing have been introduced. Sharma et al., [13] proposed a novel financial economic model has a capability for provisioning a high level of QoS to end users. They used the financial option theory and accounting the cloud resources as assets for capturing their realistic value. The price is determined by using this model which represents the optimal price that the service provider would charge its end users to recover for its initial costs. The financial option theory gives a lower bound on the price that would be charged from the end users. The upper boundary of the service price is determined by using a proposed compounded Moore's law. This law was defined by the author that combines the Moore's law with the compounded interest formula [22]. The authors claim that, if the price were set between the two boundaries, i.e., upper and lower boundary, it would be profitable

for both the end users and service providers. This approach was good; but, it does not take into account the maintenance costs. The authors are also assuming that the initial costs would be the same for clients and providers, which is not true. A service provider gets a discount for buying a larger amount of assets.

Macias et al., [23] defined a genetic model for pricing in the cloud computing market. Choosing a good pricing model through genetic algorithms, that involves three main steps: define the chromosome, evaluate it's, and finally selects the best pairs of chromosomes for reproduction and discarding those pairs with the worst results. The results of the simulation presented that the genetic pricing acquires the larger revenues in most of the cases. Service providers using genetic pricing that gets revenues up to 100% higher than the other dynamic pricing strategies and up to 1000% higher than the fixed pricing strategy. The presented genetic model has a flexible genome was proven to be more stable against noise and earned more money than the one with the rigid genome. The proposed genetic model is easily implemented, flexible, and easily adapted from a set of various parameters that influence the pricing scenario. The genetic pricing approach could be further explored by defining relations between the parameters that influencing the pricing.

Mihailescu et al., [11] proposed the dynamic pricing scheme for federated clouds, in which resources are shared among the various service providers in cloud computing. Federated clouds are implemented for improving the reliability and scalability for both service provider and end users. End users in the federated environment were assumed to be capable of both buying and selling resources. In case of high market demand in cloud, fixed pricing would minimize the seller welfare because he would not have the capability of raising his price. Similarly, when market demand was low, user utility would have minimized because he would be charged more than the market price. Therefore, dynamic pricing would be profitable in such environments because it could set the prices according to the levels of supply and demand. It could also allow to offer various types of resources to end users. The authors carried out the simulations for determining the efficiency of the proposed pricing approach by comparing with to a fixed pricing scheme.

They analyze that dynamic pricing acquires better average performance with increasing buyer welfare and numbers of successful requests up to 200%. However, fixed pricing achieves the better scalability in the case of high demand in the cloud market.

Nähring [24] thoroughly study on four basic pricing strategies. The basic pricing strategies were cost-based pricing, customer-based pricing, competition-based pricing, and value-based pricing. Nähring [24] highlighted the advantage and disadvantage of each of the basic pricing strategies. On the other hand, Jäätmaa [9] emphasized strongly that a "pay-per-use" pricing scheme are regarded as the key characteristic of pricing of cloud computing. The study determines that pay-per-use pricing significantly changed the risk-sharing model between the service provider and the end users as the end user's commitment decreased. Additionally, a pay-per-use mechanism could decrease the service provider's incoming cash flow. Jäätmaa, therefore, proposed a new form of generic cloud computing pricing [9] that balanced the commitment between the end user and the service provider.

Li et al., [25] introduced a pricing algorithm for cloud computing resources. This model used the cloud bank agent model as a resource agency because it would provide the proper analysis and assistance for all members. The authors used a price update iterative algorithm to determine the price. It analyzed the historical utilization ratio of the resources; iterated current prices constantly, assessed the availability of resources for the next round, and determined the final price. The model included a user request broker, cloud banking, a cloud service agent (CSA), and a cloud resource agent. The proposed pricing model was comparatively fixed because it could not adapt to the rapid changes that typically occur in the market. However, it could reduce the costs to providers and maximize their revenues, allowing resources to be used more effectively. *Table 4* below compares pricing models inclusively in terms of feature and approach, fairness and implementation, merits and demerits.

Now, we present few pricing structure illustrations for some services. An example of PaaS is the Google App engine which provides the platform for hosting and promoting web applications in data centers which is managed by Google. The pricing structure (pay-per-use pricing) for Google App Engine is shown in the *Table 5*.

Table 4 Comparisons of various pricing schemes

Pricing models	Features and pricing approach	Fairness and implementation	Merits	Demerits
Pay-as-you-go Model [18]	The service provider sets the prices of services and price is remaining fixed. Static approach in this model.	Unfair with the users. Users may pay more for the same resources. It is implemented model [19, 20].	Users are aware about the accurate price of the services. Resources are reserved for the users for the paid fix time period.	Prices are not adjusting as per demands. Reserved the resource for users, which are underutilized or over utilized for the longer period of time.
Subscription model [20, 21]	Prices are set according to the subscription. Static approach in this model.	Generally, users gone to be overpay or underpay. It is implemented model [20, 21].	User point of view, they pay less when utilized the resources extensively.	Users are paying more for resources when they are not utilized the resources.
Pay-for-Resource model [20, 21]	Maximum utilization of resources offers. Static pricing approach in these models.	Fair for both parties includes Users and cloud providers. It is implemented.	Maximum utilization of resources.	Implementation is hard.
Dynamic Resources pricing on federated cloud [11]	This model used in federated cloud and supports various types of resources. This is a dynamic approach.	Fair for both parties included service provider and users. Because the setting of prices is on the basis of demand and supply. It is theoretical with Simulation.	Increase the satisfactions of users and also maximal the profitable number of requests.	It's not usually support the scalability during the high peak demand.
Cost-Based Pricing [24]	The setting of the price usually to merge the profit with the level of cost. It is a dynamic model.	Not fairs with users. Because the service or product values can be find and take in after the price is fixed. It is implemented.	Easy to estimate the price.	Doesn't consider the role of customers.
Value-based-pricing [26]	Price is set according to basis of users perceiving. This model used the dynamic approach.	It is fair to providers because the price is according to the value of perceiving the service by the users. It is implemented model.	Maximum revenue gain.	Difficulty occurs in the implementation.
A novel financial economic model [13]	Prices are set based on the usage. Dynamic approach in this model.	This is fair for both users and service providers. Because the price is based on the high quality of service. These are theoretical model with simulation.	Increasing the profit of providers. Improve the range of quality of services.	It does not account the maintenance cost.
Pricing algorithm for cloud computing resources [25]	It is based on the real-time-pricing. It used dynamic model.	This model is fair for service providers. This is a theoretical way of approaching with simulation.	This model increases the revenue and decrease the costs	The price cannot change as the quick change in demand and supply.
Genetic model for pricing in cloud computing market [23]	Prices are set based on the real time pricing. This used the dynamic approach.	Fair with service providers. Because maximizing the revenue. This is a theoretical way of approaching with simulation.	Easily implementation possible. Maximum revenue gain.	Not well perform in high and low demand conditions.

Pricing models	Features and pricing approach	Fairness and implementation	Merits	Demerits
Competition-based–pricing [27]	Prices are determined according to the competitor's price of services. This is the dynamic model approach.	Fair with users because prices are on the basis of competitors price. This is implemented model.	It is easily implemented.	Does not consider the user in the setting of price.
Customer-based-pricing [27, 28]	Prices are determined according to what users prepare to pay.	Fair to the users because the price is set with respect to users view. It is implemented model.	Take care of user's perspective.	Hard to set the price due to difficulty in acquiring the data and interpretation.
Hybrid pricing [29]	Pricing is set on the basis of time of job queue in wait [18]. It used the both approach fixed and dynamic model.	Fair to users because the price is adjust dynamically with a limit of static price. This is implemented model.	Easily estimate the price and reduce te overhead of computation.	It must to be used of common base price and variation limits.
Dynamic auction mechanism [30]	The model is used the setting of price with dynamic adjustment and truthfulness. This model used the dynamic mechanism.	In this tolerate, the fluctuation of consumer's distributions. This used the theoretical way with simulation.	This is time efficient.	Sometime revenue of provider would be reduced.
A double auction Bayesian game-based pricing model [31]	This method used in buying the resources from various cloud providers. Substitution of unused resources with high flexibility. Used the dynamic model.	Both user and provider are satisfied with this scheme. This is a completely theoretical model.	Satisfaction with level of setting of price of resources with high flexibility.	This implementation is hard.
Double sided combinational auctions to resource allocation [32]	This model is good for service allocation because dealing between both user and provider through double sided combinational auctions.	Both customer and provider are satisfying on the resource allocation mechanism. This is a theoretical model with simulation.	Its enable the end users to order an arbitrary combination of services from different providers.	Tough task to implement.

Table 5 Pricing of Google App Engine

Capability	Unit	Unit cost
Data storage	Gigabyte per month	$0.18
Front-end instances	Instances hour	$0.05/$0.10/$0.20/$0.30
Dedicated memcache	Gigabyte per hour	$0.06
Logs API	Gigabyte	$0.12
Blob store, logs, Task Queue stored data	Gigabyte per Month	$0.026
Outgoing Network Traffic	Gigabyte	$0.18

Source: Google Cloud Platform / App Engine Pricing

An example of IaaS is Amazon S3. Amazon Web Services are given the online web services named Amazon S3. Amazon Web Services used the Amazon Spot Instances to enable the users to bid for their unused resources. Amazon attempts the user's instances as high as the bid prices are greater than the spot prices, which is decided by Amazon based on the data center fulfillment [33]. The pay-per-use pricing structure of various Amazon S3 services is shown in *Table 6*.

An example of SaaS is Sales Cloud by the Salesforce.com, which is used CRM strategy. For example, it gives sales illustrative with an entire customer profile and history of the account, allows the end user to control marketing campaign performance and spending, tracks all the favorable

circumstances-related data includes milestones, decision makers, user communications, and other important information which is unique to the company's sales processing.

Table 6 Amazon S3 pricing

Amount of data	Standard storage	Reduce redundancy storage
First 1TB/Month	$0.0300 per GB	$0.0240 per GB
Next 49TB/Month	$0.0295 per GB	$0.0236 per GB
Next 450TB/Month	$0.0290 per GB	$0.0232 per GB
Next 500TB /Month	$0.0285per GB	$0.0228 per GB
Next 4000TB/Month	$0.0280 per GB	$0.0224 per GB
Over 5000TB /Month	$0.0275 per GB	$0.0220 per GB

Source: Amazon website

The cost structure of sales cloud by Salesforce.com is shown in *Table 7*. It charges on the basis of subscription rates, which is determined as per user, per month. It never depends on the amount of usage.

Table 7 Sales cloud pricing

Product	Description	Price(per user per month)
Contact manager	Contact management up to 5 users	$5
Group	Basic sales and marketing up to 5year	$25
Professional	Complete CRM for any size team	$65
Enterprise	Customize CRM for entire businesses	$125
Unlimited	Unlimited CRM power and support	$250

Source: salesforce.com

In our study, we have reviewed that key concept of cloud computing and basic attributes and present the thorough background of pricing in the business. We have assessed the recent pricing scheme comparison in the cloud. We have noticed that several pricing schemes are not implemented in real market of cloud even they are efficient, and their simulation result is also most promising.

The most pricing schemes used in real market of cloud are pay per use and subscription based scheme. Pay per use for used among IaaS and PaaS and the subscription is usually offered for SaaS and IaaS services in the cloud. The cost structure of the service providers would not fully define the reality, but it is one of the important determinants of pricing schemes.

5.Conclusions

This paper analyzes the various current pricing models and compares the pricing strategies for cloud services. We compare the fixed pricing model versus dynamic pricing model. On the Basis of this comparison, we conclude that the static model is simple for both to understand and estimation of profit, but some problems may occur either under provisioning or over provisioning. In additionally the dynamic pricing model is fair for users because it allows paying on the basis of QoS required by the users; also it is fair for the service provider because it helps in revenue maximization. In particular, the paper describes the basic key concept of cloud computing, such as service models, deployment model, research issues and cost structure of pricing model. This paper mainly concentrates on to compare various pricing schemes that have recently been used in the cloud service model. We present the comparison on the specific aspect among the thirteen pricing model based on the following factors, such as features and pricing approach, fairness and implementation, merits and demerits. From collation we have noted that all of the static models are implemented where as some of the dynamic models are implemented and some schemes are theoretical, on the static models the provider defines the price, but on the dynamic models the price could be defined by the provider in order to maximize revenues and rarely optimized for the users. In summary, due to the fact that concludes that the dynamic pricing models are much more fair and adequate for the users because they adjust to different variable needs. Also, they are also fair for the service providers because they support Multi-Tenants and changes in the price either increase or decrease depending on the circumstances of the market state. Finally, we noted that most of the pricing schemes help in revenue maximization it means most pricing schemes more favorable for providers over the consumer. Developing a new pricing model to satisfy real needs ranging from the various types of services to protecting the end users as consumers within the regularity and legal frameworks have been suggested.

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Conflicts of interest

The authors have no conflicts of interest to declare.

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