OPTIMIZE FUTURE CLOUD COMPUTING SERVICE SYSTEM

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ABSTRACT:

Cloud computing means reserving and retrieving data over the cloud on behalf of computer's hard drive. For taking decision to get better benefit, Cloud Company faces many problems. For this reasons, Operation Research (OR) is used to find out a better solution. Cloud Company is mainly related on three parties: (1) cloud providers, (2) cloud brokers and (3) cloud consumers and these three parties are mutually depend on each other. In this research, an inter relationship among these three parties are constructed and a mathematical model is also made by using supply chain. Past and current data are collected from three different companies who act as provider and the proposed model is used to take optimize decisions for getting better profit in future of providers.

INTRODUCTION:

Reserving and obtaining data and programs on internet in place of computer's hard drive is also known as cloud computing. The cloud is only an allegory for the internet. It moves back to the days of flowchart and presentations that would represent the huge server-farm infrastructure of the internet as nothing but a gusty, white cumulus, cloud receiving connections and doling out information as it waves. Cloud Computing is an illustration where tasks are imposed to a link of computing resources, software and services accessed on network. These servers and connections are collectively known as cloud. Using a diver's customer or other entrees point, like smart phones or laptop, customer can touch into the cloud for savings as their requirement of clouds and this is an important cause to describe it as on-demand computing [1]. Cloud computing can provide on-demand computing services with high authenticity, scalability and suitability in a distributed situations [2]. By

using rightly, cloud computing is turn out an incomparable golden and resource that always helps institutions to maintain and generate their competitive benefits [3]. As cloud computing is enlarging and being accepted in manifold business kingdoms, it takes the attention of supply chain traders. Supply chain management can benefit greatly from using cloud computing since it commits to qualify a broad and strong range of capabilities together with: decreasing the starting costs, growing the supply chain visibility, losing lead time, improving the inter-firm cooperation and supply chain integration, and decreasing reaction time to clients [4,5,6].

The growing of cloud supply chain solution is dramatic. It was found on a research [7] that the supply management sector of cloud was increased by 40% comparing with 2011 to 2013.

In this project, we try to find an easy way for cloud computing company which can help the cloud providers to make better decisions. The cloud providers provide clouds to brokers and brokers provide cloud to consumers. We make a mathematical model between cloud providers and brokers. By using this model, we find an effective way for the cloud providers to get better benefit. To find the effective way we can use the current and past data from different cloud computing companies.

TYPES OF CLOUD:

In terms of ownerships there are three types of clouds, they are

- **Public Cloud:** The cloud does not entangle any proprietary and clients can share with other clients is known as public cloud. This local option is not only for companies but also for the customers who want resilience and pliability with low operational expense [11].
- **Private Cloud:** The cloud which is possessed and operated by the consumer is called private cloud. For companies large enough to share resources between departments and organization this is only an option. Here the consumer buys hardware with virtualization technology as a capital consumption which is mortised on time [11].
- **Hybrid Cloud:** Hybrid cloud is the combination of public and private cloud. This cloud is generally a chosen option where the consumer buys a small piece of hardware with virtualization technology for its inflictions and prolongs. The rest of its uses are same as public cloud. This also requires some capital expenditure [11].

MEMBERS OF CLOUD:

Cloud computing company is based mainly on three members, they are

- **Cloud providers:** An organization or an entity responsible for making a service that can be available to cloud consumers is known as cloud provider. Requested software/platform/ infrastructure services are built by a cloud provider. The provider also operates the technical infrastructure necessary for providing the services, provisions the services at agreed upon service levels, and defends the security and privacy of the services.
- **Cloud brokers:** The use, delivery of cloud services and performances are managed by a cloud broker. The relationships between cloud Providers and consumers are also interposed by cloud broker.
- **Cloud consumers:** The final stakeholder of cloud is the consumers for whom the cloud computing services are made for support. A cloud consumer is a person who illustrates an organization that maintains the business relationship with a cloud provider.

COMPUTING AS SUPPLY CHAIN:

There are two or more parties, they are related with the rule of cloud services, information and funds. Interconnected organizations are always found in the cloud computing areas which are involved in the provision of products and services desired by customers [1].

The main purpose of every supply chain is maximized the generated overall value. The difference between the final product price and the exertion the supply chain spends in filling the customer desire is created by the value of a supply chain [2].

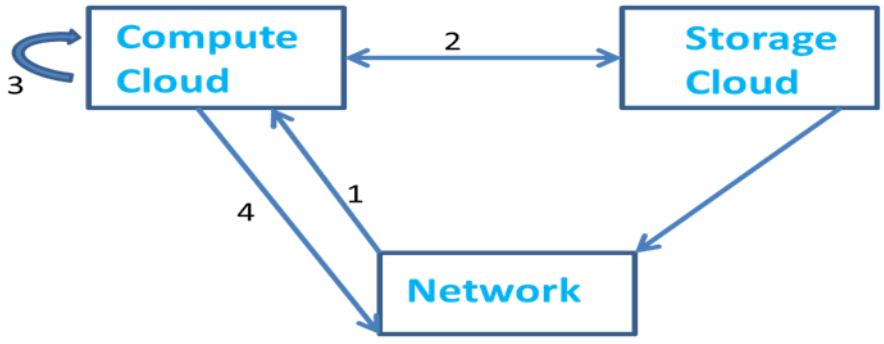

Fig-1: Cloud Computing Service

Model Formulation between Provider and Broker:

Let us consider a provider has ' z ' amount of cloud whose cost per unit is ' a '. The provider provides cloud to brokers. The provider provides z_1 and z_2 amount of hybrid cloud to n_1 and n_2 brokers respectively with rate per unit a_1. Also the provider provides y_1 and y_2 amount of public cloud to m_1 and m_2 brokers respectively at rate per unit b_1. In public cloud service the amount of private cloud are x_1 and x_2 which is got by k_1 and k_2 brokers respectively with rate per unit b_2. So the service diagram is given below:

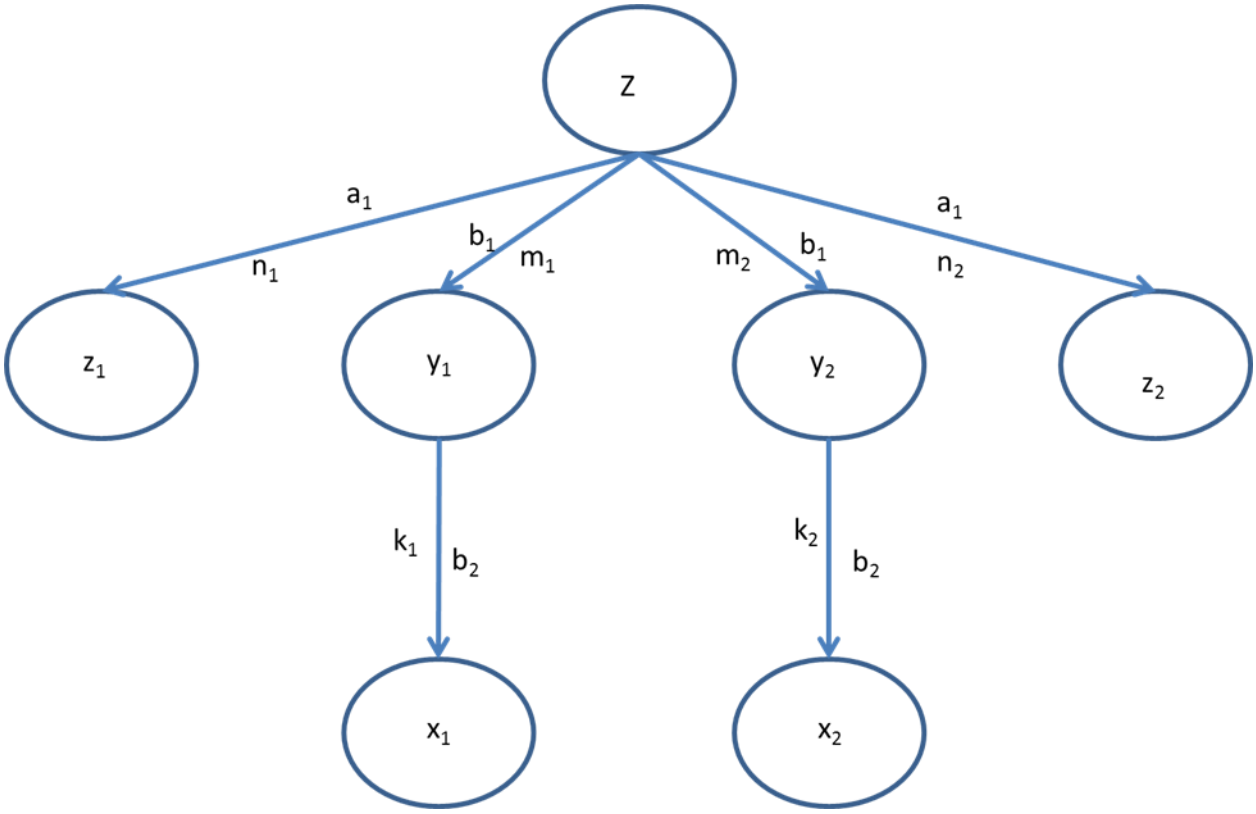

Fig-2: Service System for Provider and Broker

So, for finding benefit we have to find the total cost C and maximum income I of the provider. In this case total cost of provider

C= az + office rent + Employee rent + Current bill + Mobile cost + Carrying cost + equipment cost and $I_{\max} = a_1 n_1 z_1 + a_1 n_2 z_2 + b_1 m_1 y_1 + b_1 m_2 y_2 + b_2 k_1 x_1 + b_2 k_2 x_2$ ..... (1)

In case of hydride cloud $a_1 n_1 z_1 + a_1 n_2 z_2 \geq a(z_1 + z_2)$ ..... (2)

In case of public cloud $b_1 m_1 y_1 + b_1 m_2 y_2 \geq a(y_1 + y_2)$ ..... (3)

In case of private cloud $b_2 k_1 x_1 + b_2 k_2 x_2 \geq a(x_1 + x_2)$ ..... (4)

Now we have to solve the maximize problem where equation (1) is objective function and (2), (3) and (4) are constraints. And $n_1, n_2, m_1, m_2, k_1, k_2 \geq 0$ So, profit $P = I_{\max} - C$

MODEL FORMULATION BETWEEN PROVIDER AND CONSUMER:

Let us consider a provider has X amount of cloud whose cost per unit is d. The provider provides cloud to consumers. The provider provides x_1 and x_2 amount of public cloud to j_1 and j_2 brokers respectively at rate per unit d_1. In public cloud service the amount of private cloud are x_3 and x_4 which is got by j_3 and j_4 brokers respectively with rate per unit d_2. So the service diagram is given below:

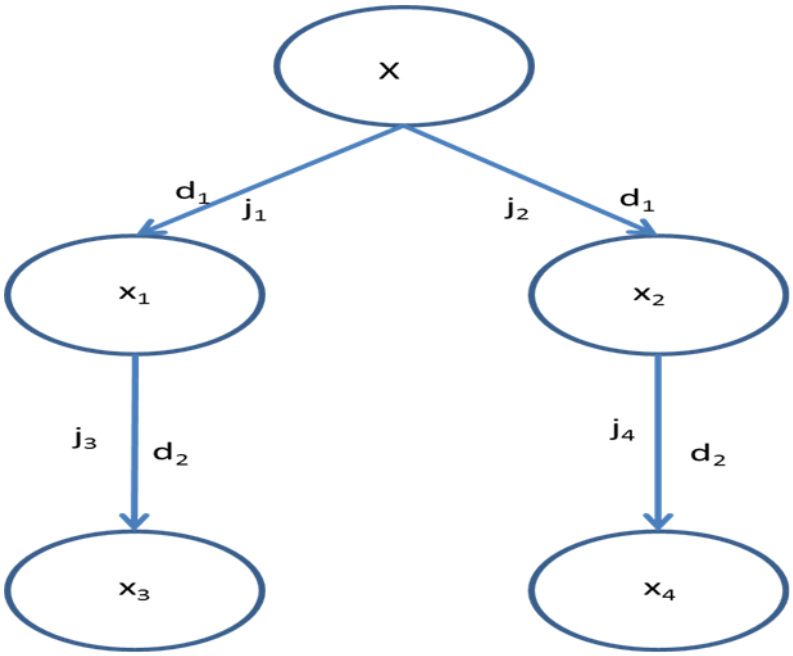

Fig-3: Service System for Provider and Consumer

So for finding benefit we have to find the total cost C and maximum income I of the provider. In this case total cost of provider

C= dX + Employee rent + current bill + Mobile cost + Carrying cost + Equipment cost

And $I_{max} = d_1 j_1 x_1 + d_1 j_2 x_2 + d_2 j_3 x_3 + d_2 j_4 x_4$ ..... (1)

In case of public cloud $d_1 j_1 x_1 + d_1 j_2 x_2 \geq d(x_1 + x_2)$ ..... (2)

In case of private cloud $d_2 j_3 x_3 + d_2 j_4 x_4 \geq d(x_3 + x_4)$ ..... (3)

Now we have to solve the maximize problem where equation (1) is objective function and (2), (3) and (4) are constraints. And $j_1, j_2, j_3, j_4, \geq 0$ .So, profit $P = I_{max} - C$

DATA COLLECTION AND ANALYSIS:

Data are collected from three different providers of three different companies from different places of Khulna city in Bangladesh. The mean of similar categories income and costs are found out and finally bar charts of three types of cloud are made by using these mean values.

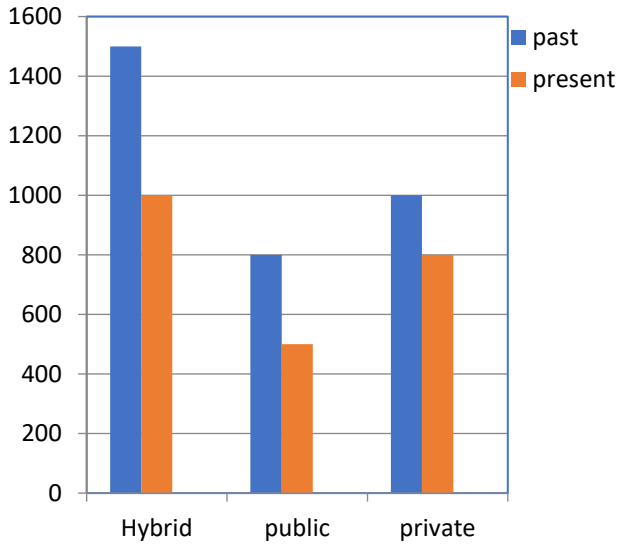

Fig-4: Price Rate between Provider Services to Broker

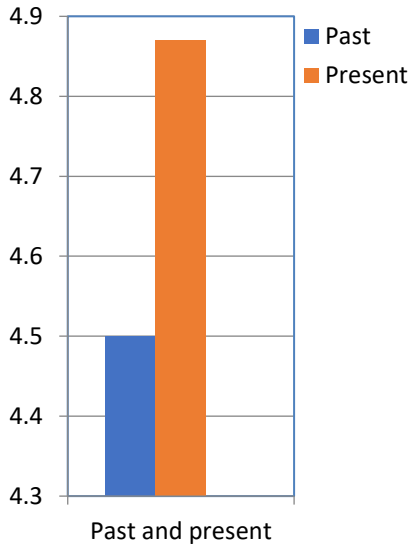

Fig-5: Profit Rate between Provider Services to Broker

Fig-4 and Fig-6 are the price rates for provider where, the horizontal line represents the types of cloud and the perpendicular line represents the cloud price rate. It has been observed that the rate of cloud price was more in past but at present the rate of cloud prices are decreasing.

The profit rate of provider is showed in Fig-5 and Fig-7 where times are described in horizontal line.

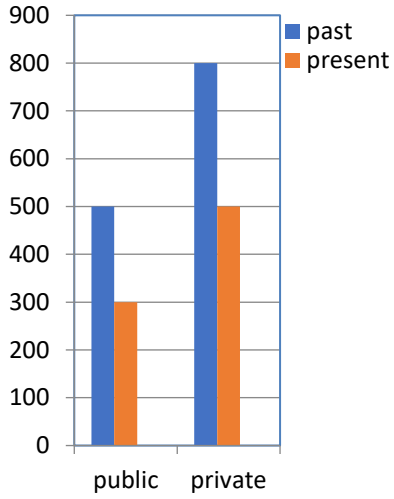

Fig-6: Price Rate between Provider Services to Consumer

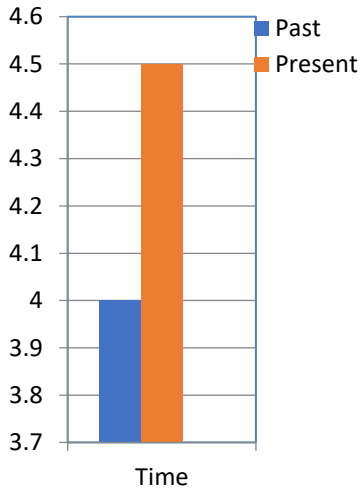

Fig-7: Profit Rate between Provider Services to Broker

GRAPHICAL REPRESENTATION OF PROVIDER SERVICES TO BROKER:

In this session, using these collected data and model a objective function and constraints are created and the model is become a linear programming problem. The maximum income for past and present are found, from collected data total cost are also get. Then subtracting the maximum income from the total cost, the profit rate for present and future are also obtained. using the same profit rate, a prediction for future is made so that the cloud provider can get the same percent of profit in future. In the prediction, the price rate of three types of cloud and the number of cloud users are found.

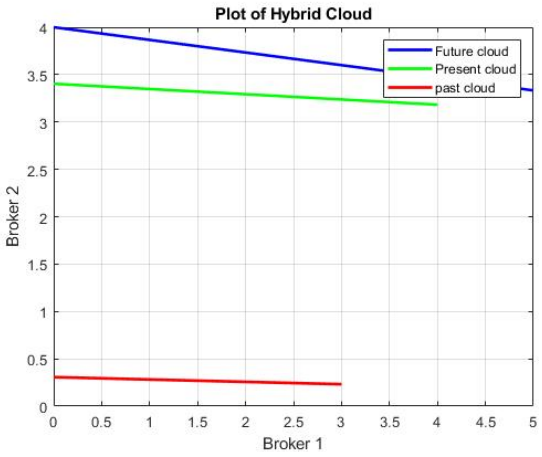

Fig-8: Numbers of Brokers for Hybrid Cloud

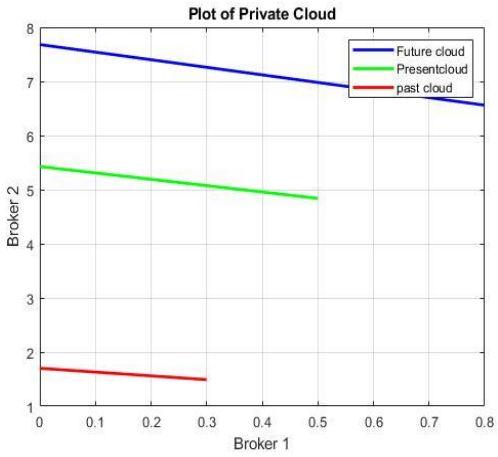

Fig-9: Numbers of Brokers for Private Cloud

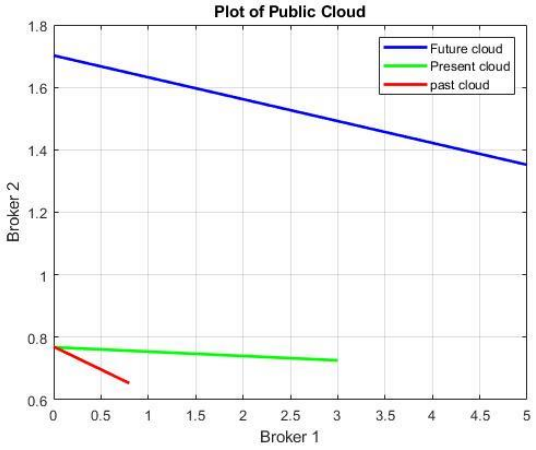

Fig-10: Numbers of Brokers for Public Cloud

All these figures the horizontal axis represent the number numbers of brokers and the vertical axis also represent the numbers of brokers and in all axis, where 0.1=100, straight lines are got because constructed model is become a linear programming model.

GRAPHICAL REPRESENTATION OF PROVIDER SERVICES TO CONSUMER:

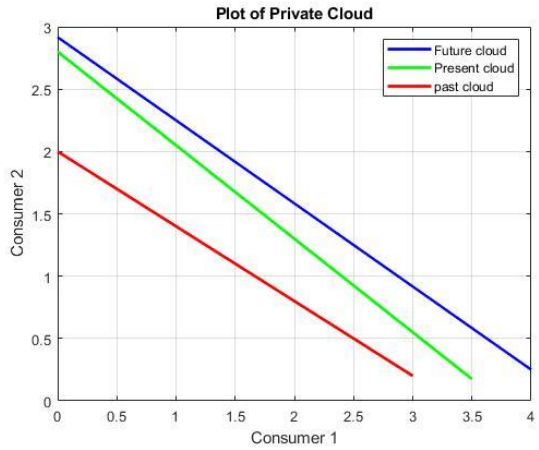

Fig-11: Numbers of Consumers for Private Cloud

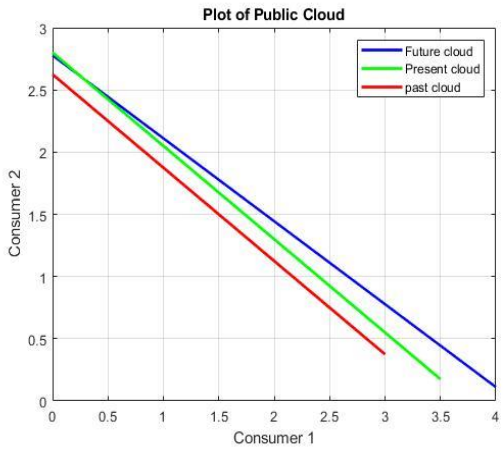

Fig-12: Numbers of Consumers for Public Cloud

All these figures the horizontal axis represent the number numbers of consumers and the vertical axis also represent the numbers of consumers and in all axis, we use 0.1=100, straight lines are get for becoming the model as linear programming problem.

OPTIMIZED RESULT:

Using the numbers of brokers and consumers from past, present and future which get from Fig-8 to Fig-12 optimized price rate and profit rate are found which are shown in Fig-8 to Fig-12.

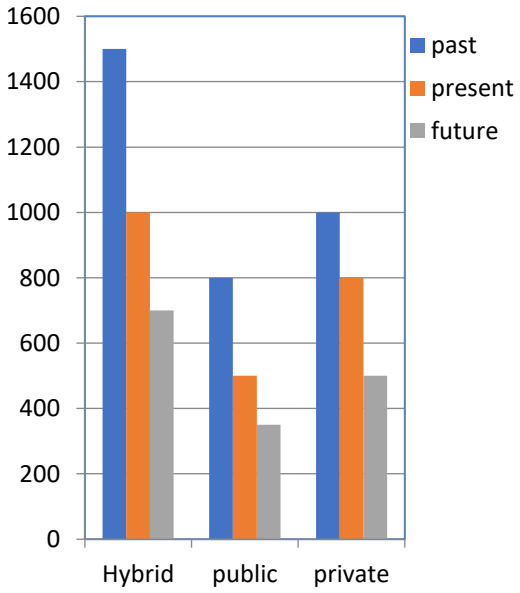

Fig-13: Optimized Price Rate between Provider Services to Broker

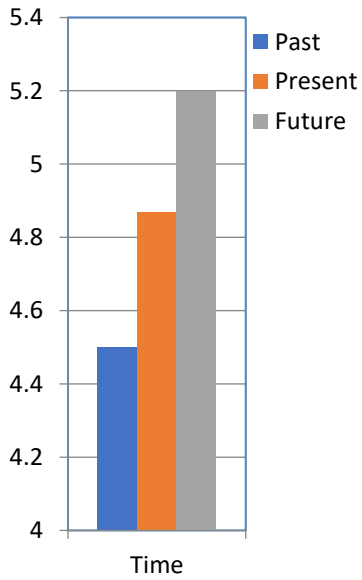

Fig-14: Optimized Profit Rate between Provider Services to Broker

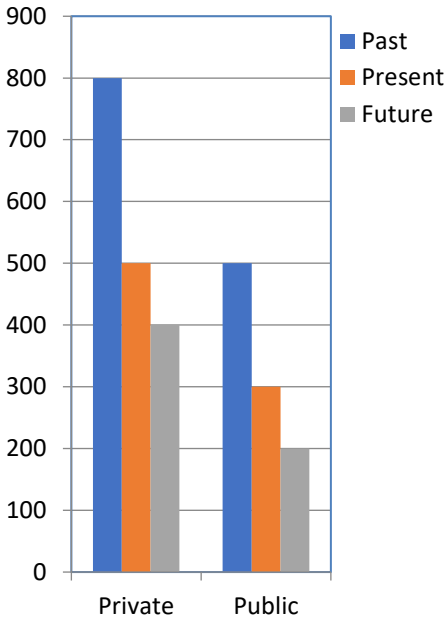

Fig-15: Optimized Price Rate between Provider Services to Consumer

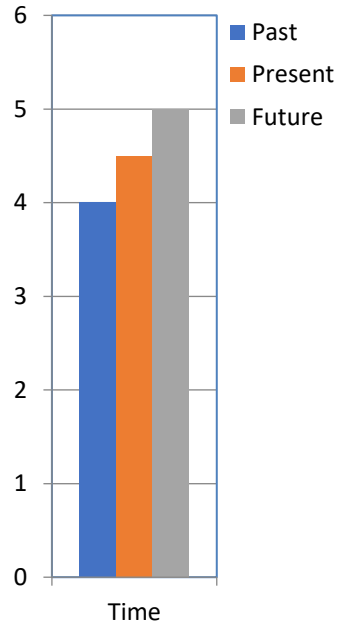

Fig-16: Optimized Profit Rate between Provider Services to Consumer

The blue color bar represents the past, red color bar represent present and green color bar represents the future clouds.Fig-13 and Fig-15 are the price rates for provider where, the horizontal line represents the types of cloud and the perpendicular line represents the cloud price rate. It has been observed that the rates of cloud prices are decreasing day by day and the optimized price rate will found in future which will be more comfortable price for broker and consumers. The profit rate of provider is showed in Fig-14 and Fig-16 where times are described in horizontal line and the provider will get more profit in future.

CONCLUSION:

From this analysis it has been seen that the profit rate at past was less than the profit rate at present. As provider want to increase profit rate in future, they have to reduce the cost and increase the income. From data collection, the cost is increasing day by day. So providers need to grow up the income. For increasing the income of provider, some facilities are taken so that

the income of provider will be increased day by day. The facilities which needs to take are given below

- Production Cost:

  The providers have to be noticed that the production cost of the cloud will be remain minimum. As our country has no production of cloud so the providers have to take cloud from the cloud producer with a minimum rate and have to make a data server in a house. The providers have to take the house with a minimum rate.

- Location Planning of Data Server:

  Provider have to take their location in such a place where the broker and consumers can come easily and the travelling cost will be minimum for serving data to the brokers and consumers. If the data server is placed at such well known place the number of broker and consumers whom takes data from the provider will be increased day by day.

- Capacity planning:

  For increasing the income of providers, the providers have to increase the capacity of data server so that they can fulfill the demand of data of the brokers and consumers i.e. the provider can satisfy the demanding data of the consumers and brokers.

- Service pricing:

  The providers have to be decreased the price rate of cloud then the consumers and brokers number will be increased.

- Security:

  The providers have to maintain the security of cloud which will be served to the brokers and consumers. So, they can get secure cloud and they can use their cloud with a great facility.

- Clouds quality:

  If the clouds quality is better than the others providers then the numbers of brokers and consumers must have to take cloud from the provider and the number of consumers and broker will be increased in this case if the price rate of cloud is increased the number of consumers and brokers will not be decreased. It is the best policy for cloud computing.

- Partnership:

  If the provider is not able to maintain the equipment then he can make the business by partnership with one or more providers. In this case he has to maintain that the partnership cost will be minimized as possible.

If the providers take that policy the profit rate of provider will be increased day by day and the number of taking cloud from the provider will be increased which will be increased the income of the provider. If the income increased then the profit rate of the provider must be increased.

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