A Structure for Assortment of Best Cloud Service Provider using Ranked Voting Method

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***Abstract*— Cloud computing involves group of remote servers and software networks for data storage and online access to computer resources.With the increasing number of web services ,discovering and selecting best services for a client is becoming very significant.Since the client don't know about the service provider.So the QoS ranking provides valuable information for making best cloud service selection from a set of functionality equivalent service candidates.To save the time and the expensive real world service incantation this paper proposes a QoS ranking to select the best service provider.A dynamic and flexible framework using Ranked Voting Method is proposed which takes requirement of user as an input and provides a best provider as output.**

Keywords* — *QoS;Cloud Computing;Ranked Voting method;

I. INTRODUCTION

Cloud computing, emerged as a latest example for utility computing, and is rapidly growing. It has gained the attention in not only large organizations but also in government organizations, even in academic organizations. Cloud computing and utility computing, both offers for delivering on demand resources. Utility computing is based on Pay per Use model. It offers computational resources on demand as a metered service. Cloud computing, grid computing, and managed IT services are based on the concept of Utility computing. Cloud computing provides three types of services: SaaS, PaaS and IaaS and it also provides three deployment models: Public, Private and Hybrid Cloud and Community Cloud.

Big and academic organizations and even users can use the benefits provided by cloud computing. Cloud users have to pay only for the operational cost, where in the Traditional data centre reduces the computing cost significantly. Customer can rent more computing resources from Cloud when the company is growing, without bothering to pay for unneeded resources and about the maintenance of the infrastructure. Organization becomes more agile as the cloud customers need not bother about the maintenance of infrastructure. Cloud Computing makes customer more eco-friendly and it also makes cloud greener as it can utilize the resources more efficiently, as the number of require servers can be less by sharing the same infrastructure that is, many customers can use the same infrastructure. The benefits of Cloud computing are disaster recovery, flexibility etc.

Many service providers offer same service on different costs or with low cost with vary in performance than other service providers. Some providers charge high for CPU and low for RAM and some others charge low for CPU and high for RAM respectively. Increasing number of service providers is making more competitive in cloud marketing day by day. Each service provider claims their best, which makes the customers difficult for selecting a provider which fulfils users QoS requirement. The Cloud Service provides, from security view can have different certifications given to each of the service providers. An application is implemented with some needs of the users but the needs of the users can or might change over the time like Operating System, Platforms supported etc. For those kind of applications, the cloud service provider with MULTILIUAL is the good option. It is the case that the application is simple as per the user needs in the starting phase, but later as the company is growing, the needs of the user changes and thus the application can become more complex. Hence, the customers have to choose a cloud service provider which not only provides and satisfies the current need but should also help in future requirements.

For selecting best cloud service provider a user must identify its QoS measures which is used to compare with the various service providers. QoS measurement is difficult to understand as there are a lot of standards to measure QoS. A framework called SMI which is a standard measurement was developed by CSMIC. CSMIC is a GROUP of globally established organization which was formed in 2010 and was launched by Carnegie Mellon University. Experts from these organizations , have DEVELOPED a standard measurement framework called SMI (Service Measurement Index). There are 7 characteristics, where there are several attributes for each characteristic. A framework has been designed which considers not only metrics defined by SMI but also others metric found in analysis of QoS parameters. There are 2 types of metrics: user dependent and application dependent metrics. To rank the providers, we used ranked voting method. Each metric will behave as a voter and it compares

its metric value with the provider's value for that particular metric. After getting ranked voting data which contains voter list ,ranked voting method was used which was proposed by Tsuneshi Obata and Hiroaki which is used to find the best cloud service provider.

In Cloud computing large pool of systems are connected in private or public networks, to provide enthusiastically scalable infrastructure for application, data and file storage as shown in Figure1. Cloud computing is a practical approach to experience direct cost benefits and it has the potential to transform a data center from a capital-intensive set up to a variable priced environment. The idea of cloud computing is based on a very fundamental principal of 'reusability of IT capabilities'. The cloud computing brings compared to traditional concepts broaden horizons across organizational boundaries. The flexibility of Cloud computing is a function of the allocation of resources on demand. . Cloud computing is defined as:
"A pool of abstracted, highly scalable, and managed compute infrastructure capable of hosting end-customer applications and billed by consumption."
This paper is organized as follows. Section II mentions that why SMI is used. Section III provides a global view of cloud computing. Section IV details quality of service metrics.. Section V details the method to rank service providers. Section VI concludes the work.

II. WHY SMI(SERVICE MEASURE INDEX)

The service measure index is currently being developed by Cloud Services Measurement Initiative Consortium (CSMIC) . It consists of business-relevant Key Performance Indicators (KPI) that provide a standardization method for measuring and comparing a business service. It is designed to become a standard method to help an organizations measure cloud-based business services based on their specific business and technology requirements. The Cloud Service Measurement Index Consortium (CSMIC) has laid down certain metrics for evaluation and comparison of the service providers, which are collectively termed as Service Measurement Index . SMI is based on ISO standards and defines seven groups of QoS attributes which act as a foundation on which different providers can be cross compared. These attributes act as Key Performance indicators of the providers' efficiency. Thus SMI acts as a road map which investigates towards better overall judgment. The SMI framework provides a entire view of QoS needed by the customers for selecting a Cloud service provider based on: Accountability, Agility, Assurance of Service, Financial, Performance, Security and Privacy, and Usability. There are many attributes in each category. Each attributes helps to define the metric in detail and also helps in collecting data to measure that particular metric. Although all attributes in list are important, this work provides flexibility to user to select some attributes as voter according to its need.

There are currently no publicly available metrics or methods which define these KPIs and compare Cloud providers. SMI is the first effort. Figure 1 shows the hierarchy of SMI framework.

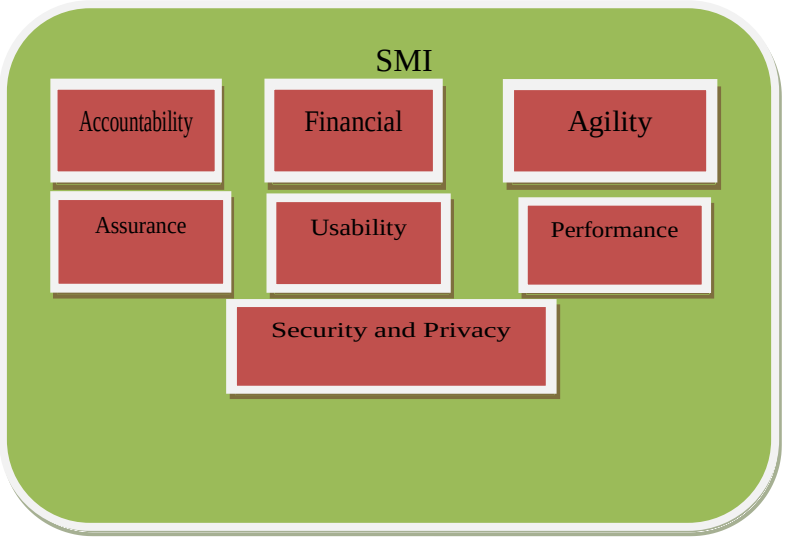

Figure 1: Categories of SMI

III. GLOBAL VIEW OF CLOUD COMPUTING

There are many numbers of service providers in Cloud market. They advertise their services in their own way.. Figure 2 depicts such Cloud architecture.

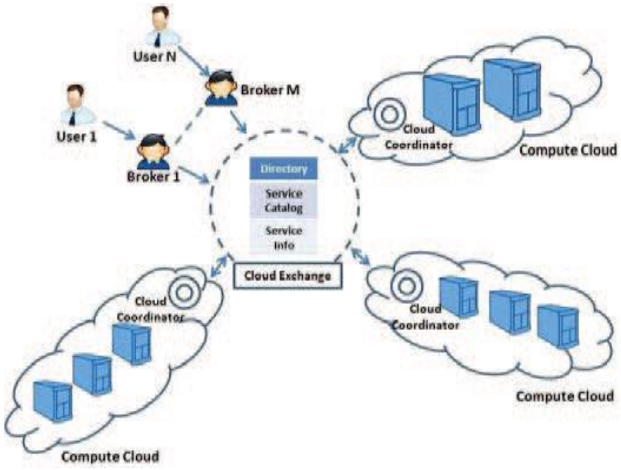

Figure 2:Global View of Cloud Computing
The components of Cloud Computing are as follows.

A. Cloud Exchange

Cloud exchange acts as central coordinator which binds together the Cloud providers, Cloud coordinator, Cloud user and Cloud broker. The Directory provide information to broker about Cloud services. Thus the cloud exchange unit have the collections of requests and offers from the various coordinators.

B. Directory

Directory holds the information which is required for selection of a best service provider. It contains two types Service catalogue and Service info.

Service Catalogue

Contains the details of all aservice providers.

Service Info

It is a storage area which has Service log and Review log. Service log is a record which contains details of all registered providers. Log records provisions all the information about history of service providers. Here, history means availability, cost, capacity, response time. Review log has the reviews of the user for the used service provider.

C. Cloud Broker

Cloud broker has the details of requirement of user and details of service provider from directory and analyse them using proposed framework in order to select the best provider. Essential QoS is informed for the broker by the user, if that QoS is not offered by a service provider, provider will be rejected by the broker for comparison. Cloud broker directly interact with users, it collects information about their experience from users for used service providers, and update service info when required. The broker's primary role may simply be to save the user's time by researching services from different providers and helps users to get the best provider for their requirement.

D. Cloud Coordinator

Cloud coordinator acts as a representative for Cloud service provider. It is responsible to provide service catalogue and service log and periodically update both. Thus the main role of this coordinator element is to represent all the available service providers within each cloud to the Cloud Broker.

IV. QOS METRICS

There are 2 types of metrics: Application dependent and user dependent. Application dependent metrics are defined based on the application's requirement and user Dependent metrics are defined on user's requirement basis.

A.Application Dependent Metrics

Availability

It is the percentage of time a customer can access the service.

Reliability

It reflects how a service operates without failure during a given time and condition.

Response Time

It is the difference between time of request for the service and time when service is available.

Operating Systems Support

Providers maintain different OS like Mac OS X, Windows, and Open SUSE Linux etc.One provider support some OS and other provider supports some other OS like Windows Azure supports only Windows operating system, while GoGrid supports Windows server 2003/2008.

Platforms Supported

Service Providers can support different OS namely Mac OS X,Windows, and Open SUSE Linux. One Provider may support some OS and the other provider may support other OS.

Throughput and efficiency

Throughput and efficiency are important measures to estimate the concert of infrastructure services provided by Clouds. Throughput is the number of assigned work completed by the Cloud service per unit of time

Cost

Cost is used to rank providers. Cost is a function of requirement of resources like CPU, memory, storage in an application. There are two types of pricing plan they are: Price bundling and Unbundling .

Capacity

It is a high amount of resources that a provider can provide to users at peak time.

B. User Dependent Metrics

Reputation

It measures trustworthiness of a Cloud service provider. Service providers takes the experience of users.

Sustainability

Sustainability is defined in terms of the environmental impact of the Cloud service used. It can be measured as the energy efficiency of the Cloud service. The property of Sustainability is divided as Accountability attribute, which is used to measure properties related to the service provider organization itself independent of services being provided.

Scalability

Scalability is evaluated in order to determine whether a system can handle a large number of application requests simultaneously or not. The scalability has two dimensions: horizontal Cloud scalability ('scale out') and vertical Cloud scalability ('scale up'). Horizontal Cloud scalability means increasing Cloud resources of the same types such as initiating more virtual machines of the same type during

peak load. Vertical scalability is an important quality measure for organizations who want to move to the Cloud.

Elasticity

Elasticity is defined in terms of how much a Cloud service can be scaled during prime times. This is defined by two attributes: mean time taken to expand or contract the service capacity, and maximum capacity of service. The maximum number of measure units that can be provided at peak times is the capacity.

Free Trial

To test their services some Providers provide free trial. It is very beneficial for users. User can test services before consumption.

API

Whether provider is providing an API to interact with server or not is also an important parameter.

User Experience

User, takes the services from Cloud, must consider the views of existing users for the services. Open users of a service can give brief detail about stability and transparency of the service in a better way.

V. CONCLUSION AND FUTURE WORK

Cloud computing supplies computing resources dynamically as a utility and resources are offered on daily basis. With a praise card any one can take services from cloud and deploy and configure servers in hours i.e. availability and functioning of computing resources in less time is now an easy task. So more customers are taking services from Cloud leading to the growth of cloud market which in turn increasing number of service providers also. Increasing number of service providers has created big confusion in selection of an appropriate service provider.

In this paper, QoS metrics are defined to calculate the Cloud services and a structure is proposed for best provider assortment using Ranked Voting Method. The contributions of this paper are discussed below.

Proposed work make various QoS attributes like location of data centre, capacity, availability, certification etc. efficiently computable. It encourages various providers specifying their QoS offers and various customers specify their QoS requirements at different excellence levels. It helps customers to understand each service provider obviously and also helps service providers to promote their service in a betterway. In turn, it also increases a healthy competition in Cloud Market.

Ranked Voting Method formulate best provider selection problem and developed a elastic framework (i.e. user can add or remove QoS metrics easily) for selection of a best provider which can be used for different applications with different QoS requirement. User can make their own voter list as per its requirement. A set of rules is defined to compare QoS values even though they may be of different value types. User may group more than one application to run on a single service provider or user may run applications on different service providers, the proposed framework suggests a best provider. Ranked voting method does not use inefficient provider's information to discriminate efficient providers therefore order of efficient provider never changes if inefficient providers are added or removed.

In order to study the performance of the proposed framework, future work will concentrate on the implementation part.

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