

# A Cloud Service Measure Index Framework to Evaluate Efficient Candidate with Ranked Technology

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**Abstract:** Cloud computing refers to the delivery of computing resources over the Internet. The companies which provide services to customers are called as cloud service provider. Services are storage, network, database etc... Increasing of the number of cloud provider it is difficult for customer to choose the best cloud services based on his/her requirements. It facilitates various providers to specify their QoS requirements at different quality levels. Experience of existing users may also be beneficial in selection of best cloud service provider. So in this paper, A cloud mediate helps the customer to choose the best cloud service providers from available providers list. The cloud mediate will have the database of all providers along with its services and cost of those services. The proposed method provides an efficient way to rank cloud providers based on multiple criteria's.

**Keywords:** Cloud swapping, User dependent Metrics, Application dependent metrics, Response time, Mediate, Quality of Service, Ranking.

## 1. Introduction

Today most of technologies you can find in the area of cloud information technology (IaaS). Among such technologies cloud computing is one of the most powerful technology you can see in these days. Cloud computing is using by most of the industries as well as individual to achieve their needs in the area of cloud. Cloud computing can be defined as "management of resources, applications and information as services over the cloud (internet) on demand". It is emerging technology that uses internet for delivering different services by different providers. These services can be broadly classified into three. They are Platform as a Service (PaaS), Infrastructure as a Service (IaaS), and Software as a Service (SaaS).

These are three types for providing services of cloud. These three models are often referred to as the "SPI Model (Software, Platform and Infrastructure) [1]".

- Software as a Service (SaaS): Clients can use the software to provide by the provider, which usually need not to install and it is usually a one of many services. Like Gmail, search engine.
- Platform as a Service (PaaS): Clients can run their own applications on the platform provided; general platforms are Linux and windows.
- Infrastructure as a Service (IaaS): Clients can put their own operating system on cloud.

And along with their deployment models such as public cloud, private cloud, hybrid cloud. Most of the big organizations and cloud user's can directly enjoy the benefits of cloud computing, by just paying operational cost rather than the cost of maintaining huge data centers. If the organization is the initial growing stage by making use of

cloud computing resources without wasting the extra amount for internal resources. The most beneficial fact regarding cloud computing is the users should not very about infrastructure maintain and rating the resources on the basis of pay per day basis. It utilizes same infrastructure for multiple user in least number of required service's other then above maintained utilities cloud offer's benefits such as multi-tenancy, flexibility, destroy, recovery etc.

Increasing the rate of cloud service provider's which may make cloud market more competitive. This factor make the cloud customer's to decide which provider is best. Who can meet their exact QoS requirements? In order to increase the cloud service most of the cloud provider provide their service in low cost with better performance it directly impact on cloud base services.

Once the cloud clients implemented cloud technology in their organization later it will change requirement of resources periodically at that point of time the clients will think how enhance their resources according to the fulfillment of current requirement as well as futures requirements.

Once the cloud computing clients going to implement cloud technology they must identify QoS resource. Mainly QoS measure's used to identify and compared most efficient cloud service provider in the market. In order to measure the cloud services CSMIC is a group which has development kind of measurement framework called SMI. This frame mainly focuses on characteristics like customer's security and privacy, performance, assistance, finical, usability and accountability.



Figure 1: System Architecture

In this current framework it not only considers matrices which have been defined by SMI along with other QoS parameters of cloud computing. These many changes encountered while designing this frame work. This frame work divided matrices into two categories:

1. Application dependent matrices.
2. User dependent matrices.

This making use of it can easily possible to rank cloud provider by implementing the voting method of voting system.

In this process the identified matrices will be consider as a voter as collect it's required value within provider again this matrices can be of various type such as numeric, Boolean etc. after finding provider with best ranking it will possible to upload the file to the cloud providers. After the file uploaded user's can rank the providers with voting system.

In the existing system of framework for ranked voting method [6] here Mediate will act as intermediate between user and cloud exchanger. But in the propose system mediate will select which is the best cloud provider.

## 2. SMI (Service Measure Index)

The Cloud Service Measurement Index Consortium (CSMIC) [9] [10] has laid down certain metrics for evaluation and comparison of the service providers, which are collectively termed as Service Measurement Index [5]. 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. The top level groups of the SMI framework include Accountability, Agility, Cost, Performance, Assurance, Security and Privacy, Usability. Within each of these groups lower level attributes are defined. These attributes act as Key Performance indicators of the providers' efficiency. Thus SMI acts as a road map which investigates towards better overall judgment.

## 3. System Architecture

The components of Cloud architecture are as follows.

### A. Cloud Swapping

Cloud Swapping acts as central coordinator which brings together Cloud providers, Cloud coordinator, Cloud user and Cloud mediate. It contains index to provide information to mediate about Cloud services information.

### B. Index

Index contains all information about service providers which are required in selection of a best provider. It contains two type of information they are: Service catalogue and Service details.

### Service Catalogue

Using service catalogue, all service providers give details about their service on the basis of defined quality metric.

### Service Details

A Service detail is a repository which contains Service log and Review log. Service log is a database which stores log records of all registered service providers. Log records keep information about history of service providers. Here, history means availability, cost, capacity, response time, and number of successful or unsuccessful transactions etc. Review log contains information about experience of user for a particular service like reputation, feedback, transparency etc.

### C. Cloud Mediate

Cloud mediate takes details of requirement of user and details of service provider from index and analyse them using proposed framework. Mediate can get the needed requirements from customer and help the customer by listing out suitable cloud providers. Cloud mediate has an important role to find out the best cloud provider. It is assumed that user has already informed the Cloud mediate about its essential QoS. If any essential QoS is not offered by a service provider, mediate does not consider that provider for comparison. This framework supports only those providers that satisfy all essential QoS.

### 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.

## 4. Proposed QoS Metrics for Ranking Cloud

QoS metrics can be divided into two categories; application dependent and user dependent. It defines application dependent metrics on the basis of application's requirement and user dependent metrics on user's requirement basis. A User Experience metric is considered to measure all existing users based metrics like stability, transparency etc. the proposed metrics have been defined and explained. These

metrics will help to measure and compare service providers [8].

### A. Application Dependent Metrics

Some of the application dependant metrics are as follows.

#### a) Reliability

Reliability is used to measure operation of a service such that it measures how reliable a service is that is how a service operates without failing for the duration of a given time and condition. MTBF (Mean time between failures) is considered for reliability measure. It will be provided by the service provider for each cloud service. MTBF applies to a service that is going to be repaired and returned to operate.

$$\text{MTBF} = \text{Total time} / \text{Number of failures}$$

#### b) Availability

The availability is percentage of the time a customer can access the service. It is given by:

$$\text{Availability} = \frac{(\text{Total service time}) - (\text{Total time for which service was not available})}{\text{Total service time}}$$

Different applications require different availability rating. Global Provider View is one of the Online tools are available which run benchmark on different providers and provides an idea about availability of different providers.

#### c) Security

There are four types of security measures are considered for service measures they are:

- (i) Crypto algorithms and key management
- (ii) Physical security support,
- (iii) Network security support,
- (iv) Data security support

#### d) Data centers

The probability of packet loss increases as distance increases. Number of data centers their inter-distance and the area must be criteria to rank the service providers.

#### e) Cost

Cost is an important factor to rank providers. Basically cost is a function of requirement of resources like CPU, memory, storage and data transfer in an application. Cost mentioned here is the cost of cloud services. There are many number of cloud providers which provide the similar kind of services. Example, Amazon cloud offers small vm's at lower cost than rack space. But the amount of data storage, bandwidth etc differs. Based on user's requirements the lowest cost and best service provider should be selected based on cost.

#### f) Operating Systems Support

Providers support different OS like Mac OS X, Windows, and Open SUSE Linux etc.. One provider supports some OS and other provider supports some other OS like Windows Azure supports only Windows operating system. Different applications require different OS support. Application can rank providers based on decision whether provider provides required platform or not.

#### g) Platforms Supported

Different providers support different type of platforms. For example, CloudSigma supports Java, PHP, WinDev, and Dot Net. Different application requires different platform support. Application may rank providers like it ranks providers based on Operating system.

#### h) Service response time

Performance of cloud provider can be measured in terms of response time. Response time is the time between the user request and time taken by the cloud provider to deliver the service. Always customer will look for provider who provides services in less time. So in order to get better performance service response time should be less. So that services will be available for end users faster.

For example, if customer requests for storage service to windows azure, then response time is nothing but how much time the azure cloud will take to deliver that service.

Response time depends on many other parameters such as average response time, maximum response time and response time failure.

#### i) Throughput and Efficiency

Throughput means number of tasks completed per unit time by cloud service provider. An application is constituted as collection of tasks (n). Let T be the execution of tasks of an application in traditional data centre and To be the overhead of Cloud data centre. So, throughput (Thrapp) of service provider for an application is given by:

$$\text{Thrapp} = n / T + T_o$$

Efficiency (eapp) of a service provider is given by:

$$\text{eapp} = T / T - T_o$$

### B. User Dependent Metrics

Some of the user dependant metrics are as follows.

#### a) Reputation

Reputation measures truthful of a Cloud provider. It is based on the experience of users for service providers. Different users may have different opinions for the same provider. Reputation of a provider can be calculated taking average of rank assigned to a provider by different users.

$$\text{Reputation} = S_i / n$$

Where  $S_i$  is rank of reputation assigned by user  $i$  to provider and  $n$  is the number of times a provider has been ranked.

#### b) Client Interface

Client interface is one of important criterion that a user may consider for the selection of a provider. Different client interfaces which a user can expect are Web Access, API, FTP Access, Website, Management Console etc. User can rank providers on the basis of client interface.

#### c) Free Trial

Some providers provide free trial to test their services. It is very useful for users. User can test services before deployment. Definitely, provider with free trial service will get higher rank.



#### d) Certification

Different providers have different certifications for industry regulatory compliance e.g. Amazon has certification of SAS 70 TYPE II, ISO 27001, and HAPP etc. A user may prefer one certification over other. So, user can rank providers on the basis of the type of certification it expects from provider. User can give weights to certifications according to its need eventually to rank providers.

#### e) Sustainability

Sustainability can be defined in terms of either the life cycle of the service itself or environmental impact of the Cloud service used. Therefore, we subdivide it into two attributes: service sustainability and environmental sustainability.

- Service sustainability is defined as how many components of a service can be reused without change with evolution of user requirements. Therefore, service sustainability is given by:  

$$\frac{\text{Number of features provided by service}}{\text{Number of features required by the customer}}$$
- Environmental Sustainability can be measured as the average carbon footprint of the service. The metric of carbon footprint is complex and depends on many factors. Therefore, SMI Cloud can get the values using Carbon calculators such as PUE Calculator [2].

#### f) Scalability

It is compulsory to access in order to find out if a system can handle a series of application requests simultaneously or not. The main feature Elasticity in Cloud computing has ability to scale resources. It has two dimensions: horizontal and vertical scalability that means increasing resources of same time during a time when it is high in demand. Horizontal scalability is also known as Scale Out.

#### g) Elasticity

Elasticity can be understood by its two fundamental elements: Time and Cost [3]. Time means how much time a service provider takes to provision or de-provision resources and cost means whether service provider charges on per hour basis or per minute basis.

$$\text{Elasticity} = W1 * \text{time} + W2 * \text{cost}$$

W1 and W2 are weights of time and cost.

#### h) User Experience

Experience of a user with a service is an important factor. For the proposed framework, it is assumed that existing users rate Cloud services on level 0 to 10. Higher value of level indicates the better experience of users with that service.

### 5. Table: Catalog Service provider

PROVIDER	PRICING	AVG	SLA	DATACEN	CERTIFICA	OS	COST	PLATFORM	CAPACITY	PRICE
Amazon	monthly	39.99	99.90%	8	no	Mac OS X	4000	PHP	200	60
Amazon	pay-as-yo	80.81	99.95%	7	yes	windows	2000	java	500	30
Amazon	monthly	137	100%	1	yes	windows	4000	dot net	300	50
Amazon	pay-as-yo	273.6	100%	2	no	Open SUS	6000	WinDev	400	30
Google_a	pay-as-yo	87.6	100%	4	yes	windows	7000	dotnet	600	40
Google_a	pay-as-yo	51.1	100%	9	yes	Mac OS X	2000	dot net	600	40
Google_a	monthly	135.05	100%	2	yes	Open SUS	3000	PHP	300	50
Google_a	pay-as-yo	133.39	100%	9	yes	windows	3000	java	400	50
Google_a	pay-as-yo	135.05	100%	9	yes	Mac OS X	4000	java	400	30
Drop_box	pay-as-yo	51.1	99.09	4	no	Open SUS	6000	PHP	200	60

### 6. Ranking of Cloud Service Providers

To find a best provider for a user, ranked voting method is used [4]. In ranked voting system, voter ranks alternatives in order of preference. As discussed, a list of metrics to find an efficient cloud provider. Each metrics will act as a voter, Cloud providers are candidates for them. Thus, a ranked voting data set is prepared.

#### Ranked Voting Method

To calculate rank using ranked voting algorithm as follows:-

Let m be the number of cloud providers and K is the best cloud providers.

Consider 1.....m number of service provider (m=4) and 1.....k as the best cloud provider (k=4) in that one we have to select which one is best cloud provider and arranged in ascending order as the best cloud provider. (k<=m).

Consider i=1.....p means user giving the votes or rating.

J=1.....q means number times user use the services. That is given by:

$$H_i = \sum_{j=1}^K S_j P_{ij}$$

Here H<sub>i</sub> means value of number provider is given by S<sub>j</sub> means average of the rank, P<sub>i</sub> means user giving the votes and P<sub>j</sub> means number of times user use the services. This calculated value is given to the H<sub>i</sub>.

$$K=H_i \leq m$$

By calculating we can find the best cloud provider and the value is assigned in ascending order and cloud provider is assigned in ascending order and these information stored in database.

## 7. Conclusion

Today most of cloud computing providers provide pay per use basis by making use of credit card any one can purchase or deploy and configure cloud services in very less time. If the amount of users increases it directly relate to include the cloud market and increasing the amount of cloud computing providers, but once cloud providers increases in the market then it will big confuse for customer to find out which service providers is best and appropriate to setup cloud service from that providers

In this paper by making use of QoS matrices it's quite easy to find out which service provider is best in the market, the main idea behind the QoS matrices it will implement the "Ranked Voting Method" This ranked method service, really very helpful for finding the cloud provider services and analyses the services In this paper it is implemented that the mediate is the one who is going to analyse the best service provider on the basis user voting which have done online, the mediate is responsible for collecting the overall voting rank from users and mediate will select best cloud providers after selecting the best provider user can use the services or upload the file in cloud market

This ranked voting system clearly find out which provider is efficient one, it can also be possible to add or remove the inefficient cloud service providers from the list, this is the best part this paper that have been implemented.

## References

- [1] "Security Guidance for Critical Areas of Focus in Cloud Computing", in Cloud Security Alliance (ASA), April, 2009.
- [2] H. Pan, Green Data Centers Monthly Newsletter February 2010. Information Gatekeepers Inc.
- [3] S. Islam, K. Lee, A. Fekete, A. Liu, "How a consumer can measure elasticity for cloud platforms," in Proceedings of the third joint WOSP/SIPEW international conference on Performance Engineering, Boston, Massachusetts, USA, 2012, pp.85-96.
- [4] T. Obata, H. Ishii, "A method for discriminating efficient candidates with ranked voting," European Journal of Operational Research, vol.151, 2003, pp.233-237.
- [5] Saurabh Kumar Garg, Steve Versteeg<sup>†</sup> and Rajkumar Buyya "SMICloud: A Framework for Comparing and Ranking Cloud Services" 2011 Fourth IEEE International Conference on Utility and Cloud Computing.
- [6] Gaurav Baranwal, Deo Prakash Vidyarthi "A Framework for Selection of Best Cloud Service Provider Using Ranked Voting Method" 978-1-4799-2572-8/14/\$31.00\_c 2014 IEEE.
- [7] Princy Bathla, Sahil Vashist "A Sophisticated Study of QoS Ranking Frameworks in Cloud Computing" Volume 4, Issue 7, July 2014 ISSN: 2277 128X International Journal of Advanced Research in Computer Science and Software Engineering.
- [8] Amrutha. K. K, Madhu. B. R "An Efficient Approach to Find Best Cloud Provider Using Broker" Volume 4, Issue 7, July 2014 ISSN: 2277 128X International

Journal of Advanced Research in Computer Science and Software Engineering.

- [9] "Cloud Service Measurement Index Consortium (CSMIC), [www.cloudcommons.com/servicemeasurement](http://www.cloudcommons.com/servicemeasurement) Index 2012.
- [10] CSMIC Consortium, "Service Measurement Index Version 1.0," Carnegie Mellon University Silicon Valley Moffett Field, CA USA, pp. 1-8, 2011.

## Author Profile



**Shruthi Shirur** is Intern –I. She has done B.E. (ISE), M.Tech. She has worked for four months in a company. Shruthi Shirur has worked in the area of in cloud networking which includes the finding the best service provider in the cloud and building the different application in cloud using the particular programming language and designing the application done the best work in industry.



**Mr. Annappa Swamy D.R** is working as Associate Professor –I. He has done B.Tech, M.Tech. He has experience of 9 Years (Industry) + 10 Years (Teaching). He has worked in the area of Data Centre Management, Networking which include Infrastructure Management-Hardware/Software, Planning, Design & Implementation of networking facility, user co-ordination, system study, project planning, project handling, preparation of functional & technical specifications, technical evaluation of bids, procurement activity, vendor management. He has attended various workshops, trainings and other corporate learning programmes