

Enhancing Consumer Trust and Satisfaction towards Cloud Services

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Abstract

In today's world, consumer of a service is prior and top significant part of a business. Cloud computing is an efficient technology with a vast amount of momentum, and its unique parameters are exacerbating various security and privacy concerns. Going from computations to the "Cloud" is making computing calculations easier towards the users; at the same time, it will bring some new security concerns regarding the safe and reliable use of data of end users or customers using the cloud. Trust is a genuine and giant consideration point which is accepted as the backbone of cloud system, or it is a representation of satisfaction of cloud users. This study firstly provides an analysis report about the trust and its boundary values which are assumed as those important features which directly/indirectly influence the satisfaction level based on the Service level Agreement (SLA). In this study, we have provided a trust mechanism called "Online Feedback Channel (OFC)" at the end of cloud users. This factor can be easily used by Cloud Service Users (CSU) to express their level of satisfaction.

Keywords: Cloud computing, trust, satisfaction, elasticity, SLA, OFC, CSU

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INTRODUCTION

Cloud computing technology is continuously evolving from the last couple of years onwards. Cloud computing technology will take time to evolve and enhance with a passage of time. Enterprises are showing great interest towards the adoption of cloud computing technology and applications. As per the estimates, by the year 2012, 20% of enterprise market will come under the area of cloud computing [1, 2]. Different organizations will be enhancing the techniques of adoption of this technology, it would be compulsory for different enterprises to rigorously monitor the adaption and compatibility of this technology for their specific business processes. Our study will provide some unique parameters which the enterprises will need to take into account before starting with the services of cloud computing. The unique attributes considerations included in our study are from the viewpoint of consumers/users of cloud computing services as compared to the

viewpoint of providers/vendors of cloud computing offerings.

FEW DEFINITIONS

What is Cloud Computing?

Cloud computing is basically a technology that enables mobility of an infrastructure provided and a application based on information technology to be used in an efficient compatible prototype; which means the end users of these applications can use what they actually demand from the application. Cloud computing can also be defined as, "a style of computing where massively scalable IT-enabled capabilities are delivered as a service to external customers using internet technologies" [3].

Cloud computing allows end users to use applications without getting them installed and can use their personal data on any system having internet access. This is implemented by centralizing the data storage, processing and

bandwidth. Cloud storage is used by a huge number of users and various organizations. All data will be stored on the hard disk of some main server of cloud system and the end user does not know where exactly the data will be stored. The data security in the cloud system is a major concern these days; many of the researchers are doing the research on the security issues of cloud system [4, 5]. But we are giving another attribute to enhance the security of cloud system.

Vendors of the Cloud

There are many companies in the market which are providing the cloud computing, enabling the various technologies to fulfill the cloud application offerings like Software as a Service, Platform as a service, or Infrastructure as a Service (IaaS) applications. The vendors are also hosting and managing the infrastructure required for the various cloud technologies. The vendor can either own the whole infrastructure on his/her own or he/she can hire some other hosting services provider. The main responsibility lies with the cloud vendor only. The famous main vendors include Amazon, IBM, Google, Microsoft etc.

Consumers of Cloud Computing Services

The cloud consumer or user is an uncertain role which is performed by a software application at the time that application will use a cloud program. Various cloud service consumers are software programs and services, workstations, laptops and mobile devices running the software which can access the various cloud services. A consumer can also be defined as a person who is using the cloud services offered by the vendor. Various retail companies are using infrastructure service provided by the Amazon for the implementation of newer threads to be used by an organization. These applications have been launched on Amazon platform by various service providers [6, 7]. These applications are designed on the top high priority by the Amazon. Various types of recourses provided by the vendor and the end user of the resources sign a service level agreement which is agreed by both the parties. The vendors are sharing the recourses to deliver the similar kind of

features to end users at the same amount of time. This will make the vendor to lessen the economies of scale to be cost effective for the overall cost. The cloud vendor will share those cost savings to the consumer of the cloud.

Reliability and Vendor Lock-in are dictated as two serious problems found in cloud computing services. Performance of a cloud can be enhanced by making it more reliable at CSP end [8, 9]. More is reliability between customer called CSU and provider called CSP, more is trust. They also dictate that vendor lock is a type of harassment for customers as once a vendor is locked with one service provider; he is locked with that provider and cannot move to another cloud service provider in case of distrust expressed by customer. In a survey report on trust and security issues in cloud computing, cryptography is the main focused factor [10]. Security is considered as major critical aspect which resists users to go ahead with cloud systems. This paper also provided a tabular representation dictating several methods with their pros and cons which are relevant to trust with cloud systems. In 2016, attribute based encryption and proxy techniques were introduced to control data access.

To reveal the efficiency of a cloud system in regard with trust, Rathi and Kumari basically had focus on factor “distrust” on Cloud Source Provider (CSP) by cloud service users (CSU) [11]. Flexibility and elasticity are the factors considered for each cloud system. Researchers have correlated trust with confidence, security and privacy in a cloud environment. Where and why trust is needed in a cloud, is one of the challenges accepted in it. They also explained about how degree of trust for a service is important with explanation about trustor (user of a service) and trustee (service providers) who have direct link with the factor trust. Degree of trust is directly propositional to interest rate that trustier places on trustee.

Cloud ‘Services’ and Cloud Computing

Cloud ‘services’ are basically the types of benefits or resources which are provided by a cloud vendor and these resources can be utilized or used by a cloud consumer on a ‘pay per use’ criteria basis. These services are also

called as industry standard interfaces like web services (using service-oriented architecture SOA [12]) or REST [13] services or any proprietary (though rarely) services. The kinds of benefits that we get from cloud computing are as following.

Underlying Hardware as a Resource:

This is the environment required for the development of various applications, also defined as the 'resource' to be provided by the different vendors. The development companies will use above platforms for coding their applications and then run those applications on the infrastructure provided by the cloud vendors. The main concern of providing and maintaining all the necessary hardware lies with the cloud vendor. Various examples of above services are Google App Engine or salesforce.com etc.

Infrastructure Role

It refers to sharing of hardware resources for executing services using virtualization technology and its main objective is to provide infrastructure on rent such as network, servers and physical data centers, CPU cycles, RAM

etc. as a service to the users. The users do not need to purchase own physical hardware and physical data centers. Virtual infrastructure is available to user and cost is paid according to its use basis. The users pay on a per-use basis model. All three services models of cloud are shown in Figure 1.

Key Points before Going Ahead towards Cloud Services

These considerations are from the viewpoint of cloud service consumers, not from the perspective of the cloud service providers. The service providers would also have similar key considerations to be factored into before starting with the distribution of these services to end user. While there are many benefits for a service consumer to adopt some of the services offered by cloud service provider, the applicability of these services will depend on the type and growth of the enterprise. In addition, the applicability of a particular service for a particular enterprise will also depend on the size of an organization.

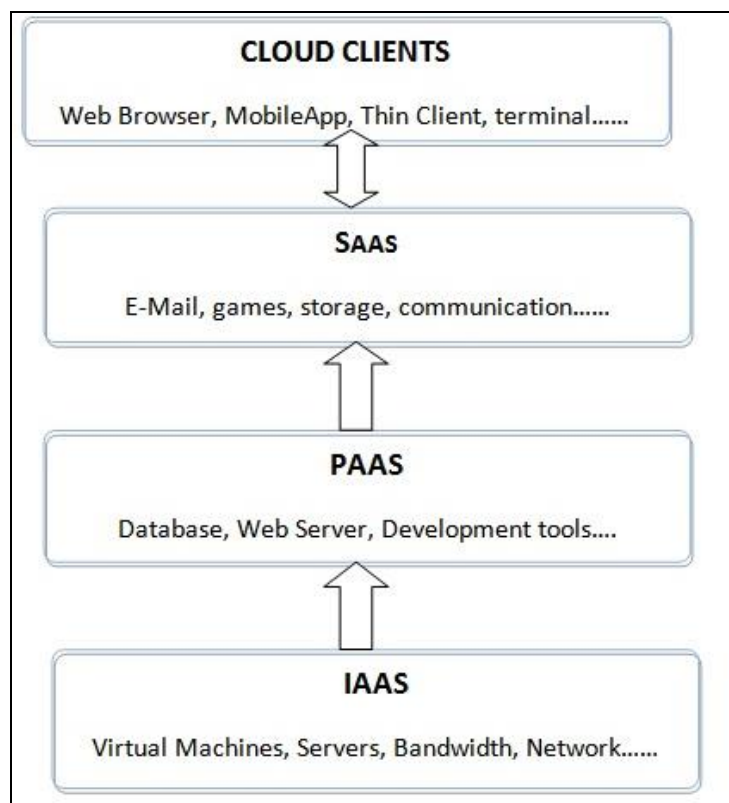


Fig. 1: Cloud Service Models.

For instance, a particular service may be applicable for an enterprise when that enterprise is in startup stage. As the enterprise grows its business, the same service which was applicable earlier, may cease to be so when the enterprise becomes big. Factors like economies of scale will play a major role in determining the economic viability of a particular service to the enterprise [14].

Key Considerations

Does Our Application Contain the Sensitive Data?

Sensitive data basically means the data whose confidentiality should not be lost at any cost. Sensitive data requires more protection as compared to non-sensitive data. Different enterprises are also imposing regulations and norms to the different domains for which they are developing the products. Various examples of this type of cloud are financial information, medical records and intellectual property. So it is risky for the end user to float sensitive data on the cloud without considering various security concerns.

Who Will Use the Application?

Where will the users of the application be located? Will it be used by customers, business partners or employees? If the application is to be used only within the enterprise or group then the private cloud deployment would be a better option as compared to the wider level cloud. If the application is to be used on worldwide level, then we can deploy public cloud as compared to private cloud. Whether we are deploying local or public cloud architecture, both the models should be provided with security features to prevent the unauthorized access by the attackers and malware from different locations.

Will Your Organization Require the Data Transfer between the Cloud Environment and the Internal Environment?

If your organization is working on a large volume of data then we come with the need of data transfer for backup purpose. It would be better if the enterprise is using its own resources to store the data in terms of higher reliability and lesser cost. Additionally, various encryption methods are also required

for transferring the data between the cloud and the enterprise internal environment.

Does Your Application Demand High Availability?

If we want our application to be available for the users all the time without any time constraints, to fulfill the need of providing higher reliability to the end users, different enterprises are using different cloud systems having different specifications. If one cloud stops functioning due to internet breakout or power failure, then the data can be retrieved from second cloud of same enterprise. Implementing multiple clouds in an enterprise will increase the overall redundancy in the system.

THE PROPOSED METHODOLOGY

The main focus in this study is on what is surrounding of trust, what factors directly or indirectly influence trust. How mutual interaction between CSP (Cloud Service Provider) and CSU (Cloud Service User) can enhance its consumption on globe. This study signs various trust issues and reasons of distrust in a cloud system [15]. Nesting of services, i.e., more than one CSP are providing services to the single CSU; also, degree of exposure, i.e., the degree of visibility of all the services that CSP is providing to the CSU. Even risk is one of the major concerns; it is related to the protection of data from unauthorized access.

Also some distrust reasons are reviewed which can be as mentioned below [16]:

- Risk of data leak.
- Security of the location where data is actually stored.
- Data damage risk.
- Risk of collapse of CSP.

Data sharing, services availability, compliance regulations and audit, backup and recovery of data, access privileges to users, governance, transparency, investigation of data, stored data location etc. are trust elements to be imposed in a cloud for getting high degree of trust.

Faith in a service is every consumer's right and it is not a kind of term which can be directly calculated. "Online Feedback Channel

(OFC)” is provided to every cloud user and proper time to time interaction will be done to look after the deficiencies which are not satisfying the end users.

Basically coding of OFC is done by using a text box as shown in Figure 1 labeled “Online Feedback” which is directly accessible to users. “Online Feedback” is descriptive in nature, allowing the users to add words or their feedback. Queries submitted by the end users will directly reach to the provider of that cloud service. This online link between CSU and CSP will strengthen the bond of users with the cloud.

This approach will require the client and vendor to build a mutual level of trust relationship, various types of norms or rules for the allocation of resources to the consumers of the cloud computing. It will ensure that the cloud vendor is concerned about the expectations of the consumer of the cloud. Moreover in the study we will also show that our method of implementation is more secured as compared to the previous methods of data access control on the cloud environment. Our idea will also require the owner of the data to participate in all the queries that the end user will make with the cloud system. To make our system more secure we will require the main user to issue various types of keys or certificates to the user of the cloud system. Each time when the user will post a query to our database, the owner of the data will be involved in all aspects [17].

Table 1: OFC Channel Provided to Cloud Users.

Online Feedback Channel		
Thumb up about	Thumb down about	Neutral about

As shown in Table 1, OFC which is online feedback channel has three columns based on thumb up and down criteria. Here, thumb rule is linked with satisfaction. If consumer is filling more thumbs down, it means dissatisfactory sign. But if thumb up column is filled, then sign of trust and reliability it provides. Also one more column is added named “neutral about”. According to it, any feature which does not require any update can be mentioned under it. It is optional. It is not a

type of objective submission and not even compulsion for all users. If anyone has paid for resources but not feeling faithful and has distrust, then he can ask any point and can send feedback quickly. Also “last seen” time clock is imposed at CSU end which is online time clock of CSP activation.

CONCLUSION

Cloud computing is one of computing fields which offer various facilities to make life more reliable, smart and stress free by a list of off handed services which a person can use anytime anywhere within internet access. To make the efficient use of cloud system, OFC will help to a greater extend. Now, a person can trust cloud system as it will allow him to express his feelings on the cloud whether he is satisfied or not. Users can even tell cloud providers if anything is unsatisfactory. So, it is concluded in this survey approach that we must add OFC as the inbuilt feature in each cloud environment to make it a user friendly cloud.

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