Satisfaction: A Scale to Fulfill Consumer's Expectation on Cloud Computing

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Abstract—Nowadays, in progressive era of innovations, world is consistently shifting towards one of the new prototype for accommodating and delivering services over the Internet. This prototype is an attractive and satisfactory model to assemble world's service providers and customers in a professional tie. Trust is one of the unique factors which cannot be judged only at service provider's end, but enrolment and feedback of consumers is one of the preliminary consideration in cloud computing. It includes various runtime measurements in the cloud. In this research, CS (Cloud Satisfaction) is proposed with simple but vital factors needed for any running compute where matter is of user's satisfaction and trust. Moreover, Cloud satisfaction is a set of steps towards its upgrade.

Keywords— *Cloud Computing, Runtime Measurements, Cloud Satisfaction*

I. INTRODUCTION

As Cloud Computing technology and services have been witnessing quite a lot of attention for the past couple of years now. We believe that, as with any new technology, it would take time for Cloud computing technology to evolve and mature over a period of time. In the path of evolution, the technology and particularly the application of this technology might undergo some changes. Nevertheless, there are definitive interests already shown by enterprises towards adoption of Cloud Computing Technology and Services. This is particularly so with respect to enterprises in the SMB (Small and Medium Business) segment. As per one of the estimates from Gartner, by year 2012, 20% of enterprise market e-mail seats will be delivered via a Cloud [1]. As per another estimate from Gartner, Software as a Service is forecast to have a compound annual growth rate of 17% through 2011 for CRM, ERP and SCM markets in SMB segment [2]. While the enterprises are exploring the possibilities of adopting this technology, it is imperative for these enterprises to critically evaluate the applicability and suitability of this technology for their specific businesses. This article provides key considerations that the enterprises need to take into account before embarking on cloud computing offerings. The key considerations dealt in this article are mainly from the perspective of consumers/users of cloud computing services rather than from the perspective of providers/vendors of cloud computing services. Cloud computing refers to the technology that enables functionality of an IT infrastructure, IT platform or an IT product to be exposed as a set of services in a seamlessly scalable model so that the consumers of these services can use what they really want and pay for only those services that they use (Pay per Use). A more formal definition of clouding computing [3] as per Gartner is: "a style of computing where massively scalable IT-enabled capabilities are delivered as a service to external customers using internet technologies"

A. Cloud Vendors

These are companies which provide the required cloud computing enabling technologies to satisfy a particular cloud service offering like Software as a Service (SaaS) offering or a Platform as a Service (PaaS) offering, or Infrastructure as a Service (IaaS) offering. The vendors also host and manage the infrastructure required for the above technologies. (Note: The vendor can either host the infrastructure on his own or can employ another hosting provider. But the bottom line responsibility remains with the cloud vendor). Some of the vendors include Amazon, IBM, Google, Microsoft etc.

B. Cloud service Consumers

A consumer of a cloud service is an enterprise or an individual user who uses cloud services provided by cloud vendors. For example an enterprise (for example a financial services company or a retail company) might use IaaS service offered by Amazon to implement the applications and processes used by the enterprise. These applications are built on top of the Infrastructure provided by Amazon. These applications are then hosted on Amazon infrastructure by the vendor (in this case Amazon). The vendor and the consumer will have service level agreements (SLAs) which are agreed upon contractually. The vendor can use and share the infrastructure to provide similar services to multiple consumers at the same time. This would enable the vendor to leverage the economies of scale to optimize the costs. The cloud vendor can then pass on these costs savings to the consumer as well.

C. Cloud computing 'technology' and Cloud 'services':

Cloud computing 'technology' refers to the technology (including infrastructure, platforms and applications) that enables the IT functionality to be exposed as services in a multitenant manner. The enabling technologies include (but not limited to) virtualization, grid technologies, SaaS enabled application platform (SEAP), Service Oriented Architecture (SOA), Metering tools and technologies etc. Cloud 'services' refer to those types of services that are exposed by a cloud vendor and that can be used by a cloud consumer on a 'pay peuse' basis. These services are exposed as industry standard interfaces like web services (using service oriented architecture SOA or REST services or any proprietary (though rarely) services.

1)   The types of these services can be classified as :

a)   Software as a Service (SaaS): Applications like customer relationship management (CRM), Email, Instant messaging (IM), office productivity applications that are offered as a 'service' by a cloud vendor.

b)   Platform as a Service (PaaS): This can broadly be defined as application development environments offered as a 'service' by the vendors. The development community can use these platforms to code their applications and then deploy the applications on the infrastructure provided by the cloud vendor. Here again, the responsibility of hosting and managing the required infrastructure will be with the cloud vendor. Some of the examples are, Google App Engine [4]or salesforce.com Force.com etc.

c)   Infrastructure as a Service (IaaS): Here the entire computing infrastructure is provided as a 'service' by the cloud vendor. The actual computing infrastructure that is provided could be a storage environment, database environment, or a complete Linux environment. Here again the responsibility of hosting and managing the infrastructure will be with the vendor. Examples include, Amazon EC2 , Amazon SimpleDB , Amazon S3 .

2)   Key Considerations before embarking cloud services: These considerations are from the perspective 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 embarking on providing these services. 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 nature and size of the enterprise. Not all services are applicable for a particular enterprise. In addition, the applicability of a particular service for a particular enterprise will also depend on the size of an organization. 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 seize 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. Key considerations for high satisfaction are:

- How is the demand for using the cloud services provided by the vendor? Is it mostly constant or widely varying? An enterprise with widely spread geographic presence might have constant demand. Cloud services are more appropriate for varying demands than for constant demand.
- What is the frequency of usage? Is it highly frequent? Very frequent usage in fact makes less economic sense to go for Cloud based 'Pay as you Go' model.
- Do we need highly customized services/API (application programming interfaces) to be exposed by the vendor? Cloud vendors would not find it economically attractive to provide highly customized services and hence price for

enterprise (users of cloud) might also be not very attractive. Is the application mission critical? A mission critical application would need very stringent SLAs, which cloud vendors could not be able to satisfy as yet.

- In which stage is your Line of Business (LOB) or the company in the growth path? A startup or a new LOB (with some inherent long term risks) would be more amenable for a cloud based model to start with. Once the business matures and stabilizes, moving to an on-premises model could be a better option (based on considerations like increased frequency of usage, demand and scale of operations).
- What are your organizations preferred technology and development platform? What are your long term plans for this? Vendor Lock in is one of the major issues in cloud based services like PaaS. Migration from one cloud environment to another would be much more challenging than migrating within on premise software.
- What are the integration requirements of the SaaS based applications with other applications/processes within your organization? The integration between SaaS offerings from different vendors is a challenge unless provided by the vendor out of the box..

II.   RELATED WORK

In order to demonstrate the effectiveness of correlation among attributes in trust computing, researchers compare the QoS trust model [5], our basic Naive Bayes approach has been improved. In the QoS trust model, the trust value is a weighted average of the QoS attributes.

In [6], a hybrid trust model is proposed with overall trust of a service of a firm relies on objective trust based on service monitoring and subjective trust based on users feedbacks. The objective trust is related to QoS attributes specified in the SLA. It calculates the overall compliance of the values agreed in the SLA and the monitored values. It has taken past relations of the service with the current user and other registered users. It is based on feedbacks from several users. It defined exponentially weighted moving average method (EWMA).

In [7], the study focused on flexible, dynamic and scalable nature of cloud environments, selecting trustworthy cloud services relying on their reliability, credibility and behavior is urgently required experimental results prove that our proposed approach outperforms the traditional Naive Bayes trust models and capable of detecting malicious assessment.

In [8], a hybrid trust model is proposed. In this model, the overall trust of a service of a certain provider relies on objective trust based on service monitoring and subjective trust based on user's feedbacks.

III.   THE PROPOSED WORK

As cloud services are now a consistent module of IT setups with its huge collection of rich sources. There is not even an iota of doubt that cloud services are widely used in many forms such as IaaS (Infrastructure-as-a-Service) and PaaS (Platform-as-a-Service) [9]. Cloud is a roof which sheds lot of entities. Entities can be on service side or consumer side,

overall the matter of concern is trust in cloud firmament. In this study, gratification is calculated on the behalf of few factors. Mathematically, this phenomenon is advised with following formula.

$$CS = LoCS - EoCC \qquad (1)$$

In Equation (1) as mentioned above,
CS: Cloud Satisfaction
LoCS: Level of Cloud Services
EoCC: Expectations of Cloud Consumers

Basically a scale has been designed based on various factors having positive impact on main aspect called CS (Cloud Satisfaction). CS is influenced by quality of expectations. Overall, enhancements in the cloud services will automatically reduce the chances of consumer's dissatisfaction. So, overall calculation of any cloud satisfaction is alarmed   clients will get what they expect and what they need. It means, this factor called LoCS (Level of Cloud Services) is certainly needed with its high positive value. As the level of services will increase, automatically there will be less chances of lack of facilities expected by any type of its user. Cloud satisfaction will automatically give high rank to different cloud services by its consumers.

In proposed study, 'REPORT' as mentioned in figure 1 is used to achieve high positive value of LoCS.

R: Reliability	E: Efficiency	P: Pay-as-per-need	O: Organized Data	R: Responsiveness	T: Tangibles

Factors with positive demand and high values

Fig.1: Positive values scale

A.   REPORT as focusing term for making cloud more familiar:

a)   Reliability (R): It is one of the factors to provide satisfactory level to its vendors. Reliability means soundness of services and its consistency. For a specified period, it is the ability of the service to perform essential functions under stated conditions.

b)   Efficiency (E): It means how much a cloud is effective with all its services. It comprises no delay in services, quick response, fault tolerance, less transmission time and many more.

c)   Pay-as-per-need (P): It is striking and most concerned demand by consumers of optimistic society. As nobody wants to pay for that which he is not utilizing. So, they want to pay for only which they have consumed or will consume.

d)   Organized Data (O): It also helps to build more confidence of service providers. In parallel, consumer's faith in specific service where everything is organized will also enhance. Thus results more satisfaction.

e)   Responsiveness (R): It means awareness of consumer's demands by service providers. It means service providers should give quick service, full support and complete action regarding what consumer's demands. So. Consumer should be at top priority.

f)   Tangibles (T): This factor covers physical aspects of the services. Sometimes, users of a service are unfamiliar with further proceed at few steps but has already paid for a particular time period. Such cases should not demoralize them. Instead of making cloud services dissatisfactory, provide them manuals and User Interface helping services inbuilt.

Positivity at extended level of above six terms of REPORT means: As high is LoCS value, more consumer expectations are coming true. Automatically, hopes will transfer into satisfaction. So, overall EoCC will be less.

IV.   CONCLUSION

While there are definitive advantages and similarly challenges to adopt cloud computing, the key considerations provided in this proposed study is that it can be used with full satisfaction point by an enterprise/user. There could be considerations which are specific for a particular industry or for a particular enterprise within an industry. Various factors are chosen that will have positive impact and maintain the satisfaction of clients and ensure that client get what they expect and what they need. The scale of positive terms is moreover effective for creating satisfaction in cloud consumers to its peak. This will allow quick adaption with high level of trust.

V.   REFERENCES

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