

Cloud Computing Quality

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Abstract

Cloud computing was and it will be a new way of providing Internet services and computers. This calculation approach is based on many existing services, such as the Internet, grid computing, Web services. Cloud computing as a system aims to provide on demand services more acceptable as price and infrastructure. It is exactly the transition from computer to a service offered to the consumers as a product delivered online.

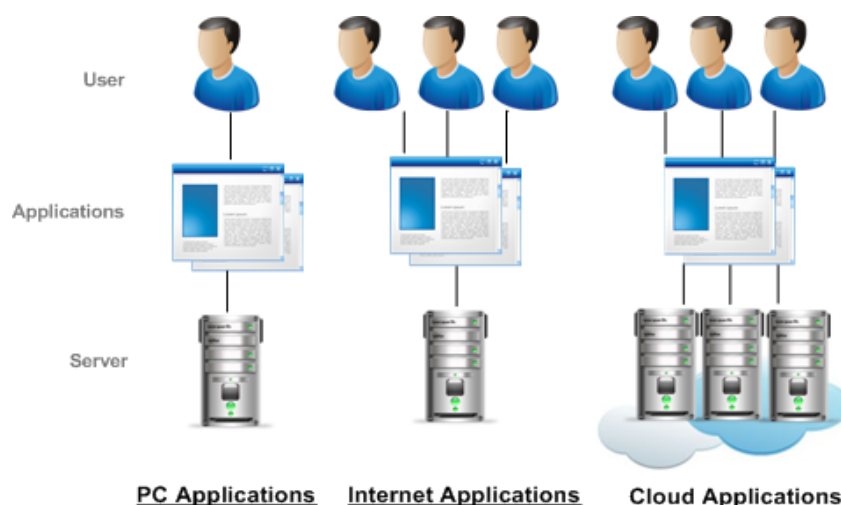
This paper is meant to describe the quality of cloud computing services, analyzing the advantages and characteristics offered by it. It is a theoretical paper.

Keywords: Cloud computing, QoS, quality of cloud computing

Introduction

The term of cloud computing is defined metaphorically; some analysts and researchers such as Buyya (2008), Forester (2008) see the cloud computing systems as updated virtualized versions, available on the Internet. Others, Youseff (2008), Armbrust (2009), Vaquero (2009) consider cloud computing to be more: it is the increasing capacity and the adding of new capabilities without investing in infrastructure, new human resources and licenses. Cloud computing is a computer system based on a subscription or pay-per-use offering services in real time on the Internet.

Cloud computing is defined as a computer model that enables fast and with minimal effort the access, which is made on demand, from a network to a common storage computing resources (e.g. networks, servers, data storage, applications and services). Cloud computing applications have broadly three areas known as cloud delivery models: Infrastructure as a service (IaaS), Platform as a service (PaaS), Software as a service (SaaS).



PC Applications **Internet Applications** **Cloud Applications**
Figure 1. Evolution of cloud computing systems

So far, there have been a few scientific definitions trying to develop a complete definition of the cloud computing phenomenon.

In his view, Armbrust (2009) states: “cloud computing refers not only to the applications delivered as Web services, but also to hardware and software systems that deliver them.”

As suggested by Leavitt (2009), cloud computing helps the companies by eliminating the necessity of buying and maintaining the hardware and software infrastructure. Erdogmus (2009) reports that two things are considered essential about cloud computing: saving money and simplified software delivery.

IT service quality

Defining the quality of cloud computing service involves an analysis of concepts: quality, quality of cloud computing services, quality assurance provided by cloud computing when analysing the characteristics and advantages offered by this service. The IEEE has defined quality as being “the degree to which a system, a component or a process meets specific customers’ needs, requirements and expectations” (IEEE, 1990). The International Standards Organization (ISO) defines quality as “the amount of features and characteristics of a process or service that bears the ability to meet the specific needs or implied” (ISO, 1991).

IEEE in association with ISO defined quality as the ability of products or services to fulfil their function. This is achieved by the features and characteristics of each product. IT service quality, that is the quality of software can be expressed therefore, by the quality attributes. There is no set generally accepted, established and described, yet a number of well-known attributes are presented in ISO 9126: functionality, reliability, efficiency, maintenance, portability.

The ranking of these quality attributes was proposed in the article “Characteristics of Software Quality” by Barry W. Boehm and others in 1978. For example, maintenance can be divided into intelligibility and testability. However, this approach had contrary views. Another classification was defined by Laprie (1985) in the paper “Dependent Computing and Fault Tolerance: Concept and Terminology” which focuses more on the reliability that they consider to be essential. However, the basic entities of all these classifications are similar to a great extent and the differences consist mainly of assignment of different categories.

Reliability as an attribute is undoubtedly, besides usage, the most important attribute of software use. More than that, most techniques of quality assurance have as main aim the improving of confidence in the system, the main focus and core of the system. The IEEE has defined reliability as the possibility of failure regarding the functioning of a system or component under specified conditions and in due time. Yet, there are major differences between the software reliability and the hardware one. The reason is that the software is intangible. It happens that the software reliability may grow with the development of new systems such as cloud computing and the reliability of hardware decrease.

The purpose

There are shown different ways of measuring and evaluating the quality of IT services in the literature. Two main categories can be identified:

1. Methods developed in terms of behaviour which are focused on measuring the activities (audience) of a cloud computing network (for example the number of IT that adopt and use the cloud computing system)
2. Methods developed from an attitudinal perspective (Galam and Sabatie, 2001:

Bressolles, 2002) which use the traditional measurement scales that evaluate the users' perceptions or appeals to the experts in the area for measuring the customers perceptions of service quality.

We will use the first method, meaning that we will analyse the quality of cloud computing services from the perspective of service use and experience. So, we will analyse the advantages and characteristics of the cloud computing systems to observe if they have the same attributes that appear in the software qualities attributes. If this is true, by comparing them, we may claim that this system provides high quality IT services.

The characteristics and the advantages of cloud computing systems

According to the National Institute of Standards and Technology (2011), and the literature such as Harding (2011), there can be summed up a series of five essential characteristics and later, another obvious ones can be added. In the category of those essentials are included: on-demand self-service, broad network access, pool of resources, high elasticity and quantifiable services.

On-demand self services. A consumer can foresee the necessary computing resources that it needs automatically, such as server time and network storage without requiring human interaction with the service provider.

Broad network access. The resources are available throughout the network and are accessed through standard mechanisms that promote use by heterogeneous client platforms, simple or complex, like: PDA, tablets and phones...

Resource pooling. The provider's computing resources are pooled as a technological pole, because they are used to serve multiple consumers using a multi-tenant model, with different physical and virtual resources allocated and reallocated dynamically depending on the consumer's demand. In this category, NIST refers to resources such as storage capacity, processing, bandwidth and virtual machine.

High elasticity. The resources required by cloud computing can be easily set and secured and, in some cases, automatically, to quickly scale the outside to the inside and reciprocally. Thus, the resources available for the consumer's purchase often appear to be unlimited and they can be purchased in any quantity and at any time.

Measured service. Cloud systems automatically control and optimize the use of resources and provide the possibility of measuring the level of abstraction appropriate to the type of services. In this way, the resources can be used and monitored, controlled and reported to ensure transparency of services which are used both by the supplier and the consumer.

To get a complete overview of a cloud system, we consider it necessary to complete the list of essential features by adding other features highlighted by the literature in the field (Vaquero et all, 2009) as follows:

- Multi location and multi-hire
- Share common resources
- Geographical distribution
- Always and everywhere access
- Orientation to services
- Dynamic resource allocation
- Self organization
- Pricing based on utility

- Heterogeneity of hardware and software
- Virtualization hardware and software for consumers
- Increase security resources
- High quality services
- Automatic scalability through self-management services in real time
- Standardization

The above characteristics lead to the achievement of two major roles to support end-user applications within a cloud system, namely: the role of infrastructure provider and that of the service provider. In his turn, the provider can orient either to the platform or to the applications.

Cloud computing can offer unique advantages for the organization that adopts it, but it requires a deep understanding of the subject to indicate correctly the true benefits offered by this system. The specific needs of the organization itself can produce a particular type of system. More than the IT needs of the organization, the system suppliers can develop cloud subscription. Some even go as far as saying that the cloud system is worth being “played”. Cloud subscription advantage is flexibility and that the organization can adjust the cost of services in a very short time.

The general benefits of cloud system are:

- Increased performance: processing time upon request
- Less maintenance: someone manage their servers and basic software
- More security: implementing centralized data maintenance policies
- Unlimited storage capacity: only use when you need a system
- It is an ecological system

The main advantages that we can identify when you call the business model dominated by cloud computing systems can be summarized as follows:

- **No massive investment in infrastructure:** for the service provider and the service consumer as well, being hired and paid when need it.
- **Decrease operating costs** as a result of rapid allocation and reallocation as needed.
- **High scalability:** as a result of sharing a large amount of their resources and provide conditions to facilitate access to these resources.
- **Easy access** to resources for a large number of users.
- **Reduced business risk and operating expenses** as a result of specialized outsourcing services for both the hard and soft.

Conclusion

Studying the basic characteristics of IT services offered by cloud computing, we noticed that all the attributes offered by a quality service are to be found in cloud systems. Usability and functionality are provided by the available resources in cloud systems, which are paid to the extent they are used. Moreover, the resources are used by more consumers at the same time, this ensuring the attribute of portability. The trust attribute, the reliability raised questions at first, but taking into consideration the increased number of customers’ companies that have adopted cloud computing, this attribute was considered to be satisfied.

Cloud computing continues to expand, to dominate the transactions of information because it offers many advantages, allowing the users to have access easily, instantly to any network device. It is to be noted that the rich and up-to-date people in technology will afford the implementation of the cloud systems at home. The future IT systems will undergo great

adjustments if big and small companies adopt the cloud computing system. The cloud computing system will become more and more important due to the characteristic it offers: having ubiquitous data.

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