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CLOUD COMPUTING - A SOLUTION TO THE CRISIS

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Abstract. Millions of people who use the Internet rely on companies and organizations which provide these chargeable services, their aim being to receive as beneficiaries those applications that provide virtualization services as advantageous as possible. In the financial context in which we find ourselves, that is this financial crisis, we believe that cloud computing systems can offer advantages regarding the Internet services expenses. The purpose of our article is to expose the capacity of cloud computing systems of controlling the financial crisis in terms of costs.

1. INTRODUCTION

The financial crisis of the last period 2007-2013 is being felt in all areas. In the IT domain, the financial crisis could reduce the purchase of certain software equipment and determine the selection and supply of some applications that are less expensive, but which are not up to expectations. The main negative aspect of the crisis was to determine the organizations to make budget cuts, but at the same time the services requirements should remain the same, that is the responsibilities should be respected and fulfilled. Cloud computing systems, as new IT investments bear this mismatch between costs and requirements during the financial crisis. Removing the approaches and classic equipment of old models, the cloud computing systems providers encourage accessing these services to achieve the same results, but at a low cost. And thus, more and more companies and organizations have begun toaccess as transfer this cloud approach.

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The cloud computing approach, through its efficiency, can bring quality services and considerable savings in IT costs.

All these changing approaches represented actually the development and transformation of IT in the true sense, transformational so developed in communication devices and remote action via mobile network and Internet. Their development is necessary because these equipments shall provide economical, political information for different independent regions and remotely controlled. To the dimensions of space and time the temporal ones are added, only that through cloud computing systems,time and place no longer matters. Thus, the emerge of these systems have only brought a change in the IT, change motivated in the article "The Future of Cloud Computing" (Şiclovan, 2012).

2. DEFINING THE CLOUD COMPUTING PHENOMENON

As it has become a very important term, the concept of cloud computing is far from being a rigorously defined topic. The definitions appeared in the context of the studied works continue the vision of each author or distributor of cloud systems by describing them within the framework of consulting firms and the market research companies. By 2007, the term was described vaguely because there were few definitions that were trying to explain the phenomenon.

Larry Ellison (CEO of Oracle) said in 2007 at the "Analysts Conference": "We have redefined the term of cloud computing so as to include everything that we already do. We cannot think of anything that is not included in cloud computing. The computer industry is the only industry that is more fashionable than women (women's fashion) "(Markus Bohm, 2009). That year, Boss G, Malladi P, Quan S, Legregni L, Hall H (2007) defined the cloud "as a pool of virtualized computer resources" (Boss G, 2007). They think that the cloud system supplement the Grid environments by supporting Grid resource management. In their article, it is noted that the cloud system does not limit the cloud Grid environments, but supports interactive applications that the user is facing, such as Web applications and three levels of architecture. Lawton (2008) briefly describes the type of applications running in the cloud: Web-based applications that are accessed through browsers, but has some desktop programs (Lawton, 2008).

Youseff (2008) was one of the first authors who tried to provide a general understanding of the term “cloud”, and its relevant components (Youseff et al. 2008). They, Youseff, Butrico and Silva see cloud computing as a multiple collection of old and new concepts published in the research areas such as Distributed SOA (SOA). According to Youseff and other authors of the article, cloud computing can be considered a "new computing paradigm which allows

users to use temporarily the network computing infrastructure, infrastructure provided as a cloud service provider to one or more levels of abstraction "(Youseff et al. 2008). When talking about levels of abstraction, the authors refer to the proposed antologies of cloud computing.

The key concept is in its natural components, meaning they are reusable and interchangeable (e.g. allowing alternative implementations, specialized interfaces and component replacement) in extensibility, customization and scalability) (Vouk, 2008).

In 2008, Buyya sees the cloud computing as a more technical approach. Cloud is a parallel distributed system comprised of a collection of virtualized computers. This system provides dynamic resources, while services contracts SLA's (Service Level Agreements) are negotiated between the service provider and the client (Buyya, 2008).

Foster (2008) and his collaborators describe the term cloud as a business. Cloud allows SMEs to avoid IT infrastructure, i.e. the purchase of new hardware and staff training (Foster, 2008). Big companies like Amazon and Google have become providers of cloud resources for SMEs based on pay-as-you-go subscription models. Thus, they can reduce the total cost of ownership and the increasing use of hardware.

Armbrust's writings (2009) offer a new image to the concept. Cloud computers refers to both the applications delivered as services over the Internet, as well as the hardware and software systems from the data centers that provide those services. The services themselves were referred to as Software Service (SaaS). When a cloud is made available as a service "pay-as-you -go" this is called Public - Cloud and the service available for sale is Utility Computing, that is utility computing. When talking about Private - Cloud, we refer to internal data centers of a business organization or other ones that are not made publicly available. So, cloud computing is the sum of SaaS and Utility Computing, but without including Private Cloud (Armbrust, 2009). Thus, the authors understand cloud computing as a collective term that covers pre-existing computing concepts such as SaaS and utility computing (Utility Computing).

Armbrust (2009) perceives the following new definition of cloud computing: (1) the illusion of infinite computing capacity available on request, (2) eliminating the contract before implementing cloud system, (3) the relationship between price and utility in a short period of use through the "pay-as-you-go" method. The research companies that have implemented cloud computing have also defined the concept. For example, the marketing company IDC (International Data Corporation) defined cloud computing very generally. Cloud is an IT delivery model, now developing and implementing, which

allows real-time delivery of products, services and Internet solutions (Gens, 2008). In this sense, this concept is the technical basis of the service itself, offering consumer and business solutions. Solutions are consumed in real time over the Internet. The technological foundation of cloud computing includes infrastructure, software system, application development and their implementation, systems and applications management software as well as network services based on IP (Gens, 2008).

In order to avoid misinterpretation, the National Institute of Standards and Technology (NIST) provided the following definition for the concept of cloud computing, which is a pattern of activation on demand, ubiquitous and convenient network access on a resource pool of configurable preset data (e.g. networks, servers, storage capabilities, applications and services) that can be planned and launched quickly with minimal management effort or service provider interaction. (Vouk M, 2008).

Vaquero (2009) redefines cloud by improving the definition of G. Boss and his colleagues. Cloud is a resource pool, usually exploited by the pay-per-use model in which the guarantees are offered by the infrastructure provider's via SLA's personalized sites (Vaquero, 2009).

In the table below we present the advantages of each author. Simultaneously, we explain how these benefits support and combat the crisis.

Cloud computing combat crisis	
Author (year), benefits	How to fight crisis
1. Boss G., Malladi P., Quan S., Legregni L., Hall H., (2007) define the cloud "as a pool of virtualized computer resources"	- Helping through the fact that many resources do not involve another cost, the cost of this system remains fixed.
2. Lawton (2008) sees cloud systems as Web-based applications accessed through browsers, but has some desktop programs.	- It involves a low of cost for architecture. - Programmes that have the aspect of desktop programmes are easy to use and do not involve training cost for their use.
3. Youseff (2008) considers cloud computing a new computing paradigm, which allows users to use temporarily the network	- There are no additional expenses during the crisis - allows the users temporarily to use the network computing infrastructure.

computing infrastructure, infrastructure delivered as a cloud service provider to one or more levels of attraction.	
4. Markus Klems (2008)-cloud computing exhibits scalability and optimum use of resources.	- Combat the crisis through the effective use of available resources.
5. Vouk (2008) the key to this concept is its natural components, that is reusable and interchangeable.	- Reusable components reduce the massive spending during the crisis.
6. Jeff Markus and Reuven Cohen (2008) consider the system as a cloud business model (pay-as-you-go) and reduce capital expenses.	- Combat the crisis by reducing capital expenses.
7. Buyya (2008) defines the cloud as a parallel and distributed system that contains a collection of virtualized computers. This system provides dynamic resources, while service contracts SLA's (Service Level Agreements) are negotiated between the service provider and the customer.	- Advantageous and effective contracts for a period of time. - Negotiated contracts in the period in which it is required the most, so that it is an advantage for the system user and the cloud provider.
8. Foster (2008) considers cloud as a business system that enables SME's to avoid IT infrastructure, i.e. the purchase of new hardware and staff training.	- Reduce the cost of maintenance and of preservation equipment and leads to the reduce purchase of hardware.
9. Armbrust (2009), cloud computing is the combination of SaaS and Utility Computing, but without Private Cloud. It	- Show how this system fights the crisis by the close link between price and utility. - Offers the same performance as the traditional system but at a

offers illusion of infinite computing available on request, the removal of the contract before the implementation of cloud system, presents a close link between price and utility in a short period of use through the "pay-as-you-go".	low price.
10. National Institute of Standards and Technology (2008) regards the cloud as an on-demand activation model, ubiquitous and convenient network access on a preset data pool of configurable resources (e.g. networks, servers, storage capacities, applications and services) that can be set and released rapidly with minimal interaction management or service provider.	- As suggested in this definition, this systemrepresents a complex and convenient one, which leads us to believe that it is favourable during crisis

3. THE GENERAL ADVANTAGES OFFERED BY CLOUD COMPUTING SYSTEM

The major benefit offered by cloud computing is simple to describe in theory, because it offers the calculation, which is well distributed and managed, due to the scale economy appeared when using the system. Such scale economy looming leads to the assertion that cloud systems combat the economic crisis occurred. This economy of scale is achieved by moving the computer hardware from a variety of companies (data centers), meaning from the companies where it exists, to be managed centrally in order to operate. In this way, the distributed hardware is less expensive for the company. According to the working document and the review of the article "Cloud computing - Overview, Advantages, and Challenges for enterprise deployment" by Brian Coombe we can say that following advantages appear:

1. Desktop Support:

Cloud infrastructure can support and reduce flexibly the cost of desktop virtualization and of traditional desktop services. The companies do not have

to maintain: a software based equipment, end-user license, version control, multiple images for any implementation. Moreover, cloud computing can enable an enterprise to deploy the end-user hardware. This allows individuals to manage the hardware according to their specific needs. It is not necessary to train the users of cloud computing as cloud software interface is similar to the classic desktop

2. Mobility and flexibility:

The cloud infrastructure can support mobility and flexibility potential, serving the end users a consistent look when providing access to the same set of services and resources in different locations. Thus, the user of this application receives documents anywhere, whether at work or at home, the services being identical regardless of location-just like accessing a computer connected to the Internet.

3. Cost and operational advantages

For large enterprises, the demand for computing offers significant cost and operational advantages. There have been various debates on the subject of the savings offered by cloud computing. According to the report published by McKinsey, there was no cost savings. This idea was immediately argued and Forrester's research points out that the use of cloud computing coincide cash flow benefits system more appropriate than the traditional model. Great investment is made at the beginning of the project a long time before all the benefits of cloud being done. Along with this system which will move on from the capital investment to operational expenditure. Cost is seen as a key factor, although it is not the only factor in the adoption of cloud computing. But it is clearly that a decision to adopt cloud computing is based on potential cost savings. Cloud computing omits costs such as paying technical staff necessary to maintain the data center operation, additional staff needed to manage server purchases, capital expenditure for cooling and power, internal technical people do evaluations and offers hardware, people negotiating the purchase of hardware, internal and external costs for data center designers, facilities management, contracts to take into account the records of all the licenses etc. And it is now that we can talk about the ability to perform the cost of gigabyte per hour, a huge impact on the economy. The comparison between a model fully budgeted and this cloud computing system is clear that it leads to the decision to promote cloud model.

4. Scalability

Computational requirements of a company are never static, and they often depend on a certain time or event. Scalability is the ability to expand and contract automatically based on the capacity needs (sometimes called elasticity), and load pattern associated with it. They are the key elements that

distinguish cloud computing from the other forms of housing. Cloud computing provides on-demand resources for many of the typical scaling points that an organization needs including servers, storage and networking. For the old system when the peak demand grew more than expected, the capacity could not be easily added to the infrastructure, immediately addressing this demand. This lead to income losses such as potentially dissatisfied customers, a competitive strategic disadvantage. In terms of software, cloud computing can enable IT developers IT development operations, implementation and running of applications that can easily increase the capacity to work quickly and without concern about the nature and the location of the basic infrastructure.

The cloud computing can make the services scalable and available on request. Companies pay only for the service used, while it is known that for a possible request extra resources available can be offered.

5. Cloud and software

The benefits of cloud computing will be truly made in the software that is designed around the system. Today, many applications were written to run on a single server that is used to a set of users. The written applications in the cloud are designed to work in this distributed architecture. These applications can be designed to scale so that additional servers or additional capacity be added without changing the code.

6. Business agility

The speed that the computing capabilities can be requisitioned is a key element of cloud computing. In the user's manual of the Kynetix (2009) it is stated that: adding extra storage space, network bandwidth, memory, computational power is done rapidly and often instantly. Most providers use cloud infrastructure software that one can add, move or change easily by staff intervention, namely the cloud provider. This dynamic and flexible nature of cloud systems is a real advantage. Many IT departments must work through the purchase processes just to add additional capacity. And this may require weeks to be done. Cloud computing allows the organizations to react much more quickly to market conditions, as necessary. The new applications can be rapidly launched with lower expenses.

The flexibility offered by cloud computing allows new ideas to be tried and tested quickly without departing daily routine of existing IT staff.

7. Device and independent location

It is the best device that enables portability and great opportunities for networking and collaboration. The user can access the system regardless of their location and the IT used equipment (smartphones, netbooks, etc.) (Kynetix, 2009)

4. CONCLUSION

The Internet based on cloud computing lead to spectacular advantage and to that change that we all need. It is true that it will be very difficult to persuade large companies which have made huge investments in traditional software equipment to give up what they have already purchased in favour of cloud equipment. As a strategic part in facing the crisis, cloud computing, through the benefits it presents, combat that additional cost which the users bear when adopting the traditional systems. So, this change is welcomed.

As a revolutionary technology, cloud computing improves a part of the problem caused by the crisis. We cannot say that it may combat the crisis, but the contribution of this technology is significant.

It is well known that in order to adopt cloud computing, both people and big companies should explore the opportunities offered by these systems and accept them.

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