VOL. 3, NO. 2, February 2013 ISSN 2225-7217
ARPN Journal of Science and Technology

http://www.ejournalofscience.org

Cloud Computing: Cloud Computing Failures

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ABSTRACT

Organizations and businesses are constantly in search of ways to improve competitive advantage, reduce the cost of operation to increase profit margins and in all cases improve operations efficiency and effectiveness. Computer automation and Information Technology (IT) have proven to enhance business operations by expedient delivery of service and enhancing the ability to communicate over large geographical areas in real time. As the cost of obtaining up to date efficient IT systems continue to rise, Cloud Computing has been taunted as a means of reducing these costs and providing an equally or in some cases a better computerized platform for business functionality. This paper looks at the issues associated with cloud service failures, the consequences of such failures and provides a forum for discussing, sharing, reviewing and collaboration among peers, business owners and service providers.

Despite the hype of a more efficient and effective system (Paas, Iaas, SaaS), cloud computing isn't without failures and the consequences of those failures to subscribers. A line of thought and implementation of such a scheme for organizations needs to be fully understood and established.

Keywords: *Cloud Computing, Failures, Data Losses*

1. INTRODUCTION

Information Technology vendors (both hardware and software) are constantly improving on the various technologies. In an bid to stay competitive, the costs of purchasing or upgrading to new products remains a area of consideration for customers and a resultant area of contention in a complex market.

Cloud computing is being pitched as a way to reduce the challenges of cost and improve efficiency for business owners. Cloud computing can be viewed as large pools of virtualized resources that are easily accessible via the internet, also giving the client the ability to use these resources as if they were stored on their own machines locally. Virtualization allows for application software scalability leading to optimal use of provided services [1].

Cloud computing can be defined as hosted services delivered over the internet. These services are generally broken down into Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) [2].

Software as a Service (SaaS) has set the stage for cloud computing. SaaS is a model or system where software applications are provided by service providers to their clients over the internet [3]. The applications are stored on the provider's servers and not locally on the user's computer system. Such an arrangement exempts the user from the responsibility of managing software. This service is provided as a pay as you go system and makes use of virtualization [4].

Platform as a Service (PaaS) is a concept for delivering software applications to subscribers over the internet. PaaS can be viewed as an outgrowth from SaaS.

It also functions without having to download or install software applications and makes all the resources necessary to support, build and deliver software services over the internet. PaaS developers do not concern themselves with the operating systems used but focus on the web development [5].

Infrastructure as a Service (IaaS) is also referred to as Hardware as a Service (HaaS) and is the delivery of hardware services over the internet. Iaas deals only with the renting out of hardware services and this includes storage servers, computer hardware network equipment, memory, CPU cycles, platform virtualization and other physical components required to run a data centre effectively. He stated that similar to outsourcing, HaaS does not come with the rigors of signing documents and monitoring of services provided that come along with length complex contracts [5]. The customer maintains ownership of their data and applications while the service provider is responsible for service delivery. This service is also scalable to meet the increasing demands of users and multiple users can have access to the system simultaneously [4].

For the purpose of this paper and conclusions drawn from various research papers, cloud computing is defined as the subscription of information technology services (such as software applications, application platforms and hardware) by an organization or customer over the internet. Payments for these services can be on a pay as you go basis for public clouds and alternative arrangements for private and hybrid cloud computing systems [6].

2. TYPES OF CLOUD COMPUTING

Various kinds of cloud computing exist namely; public, private and hybrid cloud computing. The public cloud refers to cloud computing open to the general public. This implies that anyone with internet connection

can access the services provided by a vendor provided it is open source or authorization is granted. It is also cheaper and easier to set up for the subscriber because the charges are on a pay as you go basis [7].

Private clouds on the other hand posses the same characteristics as public clouds and are managed by the organization that subscribes to its services. It is internal to the organization and only the organization has access to it [5].

Hybrid computing is maintained both by an organization internally and externally by a service provider [4].

3. ADVANTAGES OF CLOUD COMPUTING

Cloud computing isn't without its advantages. The advantages are purported to provide business owners with a more robust IT system. They include:

- Reduced cost of IT infrastructure
- Experts in the IT field are readily available
- Software updates are automatic at no additional cost
- Scalability due to large storage space owned by service providers is easier
- Ubiquitous access to information

4. CLOUD FAILURE

Despite the advantages and services provided by cloud computing, the downsides essentially need to be considered by potential investors. The confidentiality and the importance of real time access to business information when required is something that businesses need to be aware of before investing in the cloud. Being an internet service, various points of failure are apparent. In addition to internet connectivity issues, cloud service providers have also experienced down time. Losses have been incurred by subscribers and the possibility of loss is almost inevitable.

Cloud service failure that occurred on Saturday May 8th 2010 to Amazons Web Service (AWS) and lasted about 7hrs, resulting in data loss could also be considered in part to be the users fault [8]. He adds that according to Amazon the outage took place from around 12:00 am to 7:00 am affecting a set of racks. A user of Amazons EBS, David Dopson, explains that AWS promised redundancy of which they have failed to deliver as he has lost all of his data. In addition AWS promised:

> "EBS volumes are designed to be highly available and reliable. Amazon EBS volume data is replicated across multiple servers in an Available Zone to prevent the loss of data from the failure of any single component. The durability of your volume depends both on the size of your volume and the percentage of the data that has been changed since the last snapshot. As an example, volumes that operate with 20 GB or less of modified data since their last most recent Amazon EBS snapshot can expect an annual failure rate (AFR) of between 0.1% - 0.5%, where failure refers to a complete loss of the volume. This compares with commodity hard disks that will typically fail with an AFR of around 4%, making EBS volumes 10 times more reliable than typical commodity disk drives. "
> [8].

He explains that like most users, David Dopson believed that once the service failure occurred, the system would fix any problems as Amazon has said they prevent data loss. He further explains that what AWS meant was that data durability depends on the amount of data the users have and the percentage difference of the stored data since the last snapshot. They do say they prevent data loss but only if you use the system according to the guidelines they provide. The reality for AWS users is that it requires a significant amount of failure planning and most users find it difficult to learn the rules.

Amazon also expects users to know how to design their own hardware architecture correctly to prevent hardware failure. They require you to have a certain knowledge level of both system administration and their AWS to be able to get the maximum benefit [8]. He also adds that Amazon does not make this clear enough to new users and should be a red flag, boldly stated to new and inexperienced subscribers. The problem is a glorified technology with inadequate information on failure models. He argues that if the AWS vendors do not simplify the services they provide, they will have a slim market limited only to professionals.

The reality remains though, that cloud computing requires some level of expertise and companies providing cloud services need to make it explicitly clear; what services they provide; the required level of expertise to use the system to prevent data loss; and what consequences or compensations users will receive, if any, if the loss of data is not the users fault. These points in the terms and conditions cannot be vague or in small print in order to exonerate vendors and clearly warn intending subscribers.

[9], focuses on the business perspective of cloud services drawing attention to a recent outage by Gmail in Europe of which Gmail took no responsibility for this downtime in their terms and agreements. Heads adds that the outage was caused by an attempted software upgrade by Google, across thousands of servers worldwide. Business owners who find themselves in such situations have to have alternatives to cater for such losses. This buttresses the need for business owners to subscribe for services with solid customer friendly Service Level Agreements (SLAs). Such SLAs must contain details as to who takes responsibility for data loss or downtime.

[9], explains that Yahoo is only obligated to keep copies of user data while you are a paying customer with them. He argues that they only keep data for up to six months after which they delete them. They under no obligation to keep user data and can change policies at anytime. Yahoo's terms are a cause for concern. In such a system users have to make alternative backup arrangements adding to the cost of IT maintenance. Understandably though, it costs Yahoo to maintain redundant data and the idea behind cloud computing is to pay for these services. If a subscriber still has to pay for data backup, then the importance of such data has to be determined by business owners in conjunction with the amount spent on it.

Microsoft owns a giant data centre in Washington State USA [10]. He highlights a visit to this centre portraying it as a magnificent centre in built by Microsoft for their cloud computing service. He stated that when Microsoft was quizzed on what happens to data if the whole centre goes down, they stated that the data centre functions on the principle of redundancy. He further remarked on the Sidekick story. The Sidekick is a popular phone on the American T-mobile network. Both the software and the services of the Sidekick were designed by Danger, and IT firm bought over by Microsoft. There was a glitch in the system and the service for Sidekick went down losing some of the user's data in the process. Microsoft said that some of the data is recoverable while some compensation may be given to some users due to irrecoverable data.

Users of cloud services often fail to hold vendors accountable when failures occur [11]. From visits to forum websites of cloud computing vendors he states that you often see statements ranging from users who have made mistakes in their use of cloud services to users who have genuine complaints. Having spoken to many people of the record to users who have complaints, he adds that few have discussed struggles encountered with vendor customer services. Michelle Hudnall, solutions marketing manager for BSM at Novell, stressed the importance of SLAs. She explains that intending subscribers should watch out for unclear or poor SLAs, non-existence of SLAs, or general poor service provision by vendors [11]. Users need to hold vendors accountable especially in situations when service failure results in loss of revenue or income. This can be handled by renegotiating terms or finding other ways to solve the problem. He adds that accountability for service failure goes both ways.

Amazons AWS recorded recent failure as some of its data centers were knocked out of service due to power failure. Issues with the back-up generator were a just a part of the problem as most of the damage was caused by bugs in the software as the data bank tried to restore itself [12]. Google's modern web infrastructure permits it to advertise a claim of 99.9 percent up time. Foe such large systems like Amazon and Google it is impossible to continuously test the system for bugs. Gmail experienced downtime in April that left up to 35 million users temporarily without access to their email [12].

5. INEVITABILITY OF CLOUD FAILURE

The question has been asked about if there will ever be a time when cloud service availability will be at 100 percent. Views expressed by various experts in the field show that we are still a long way off from achieving such a system.

Geoff Arnold, an industry consultant and entrepreneur-in-residence at U.S. Venture Partners worked as a Distinguished Engineer at Sun Microsystems and building and managing distributed systems for Amazon, Huawei and, most recently, Yahoo, believe that 100 percent availability is unlikely. He explains that a major problem is that they have a large amount of components that interact in ways that they were not designed to, which makes it more complex to predict failures. This disparate components include virtual servers, load balancers, storage systems and other components which are essentially sewn together to function as a unit [12].

Facebook's VP of Technical Operations Jonathan Heiliger stated that web business are designed to fail meaning that the fundamental components are going to fail, but that applications should be built in such a way as to circumvent this failure prone system. Claus Moldt, Global CIO and SVP Service Delivery at Salesforce.com, explained that everything within the cloud infrastructure needs to be designed with failure in mind, further adding that that's how to run you business [13].

Conclusion, cloud computing is here to stay as it involves various information technology platforms and tools essential to running a business, such as email, storage and other advantages previously mentioned. It goes without saying that users of cloud services have to be prepared for cloud service failures and make due arrangements for alternatives or backups when such failures occur. This can be achieved by ensuring robust service level agreements (SLAs) are in place, redundancy is provided for or subscribing to multiple vendors depending on the importance of the information required for consistent access. Protection against service failure and data loss is also an ongoing process and should be handled as such.

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