

Cloud Storage, Issues and Solution

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Abstract— Cloud storage is one of the many services offered by the cloud computing. Cloud storage is much sought due to anytime, anywhere access using wide varieties of devices, for instance, laptop, desktop and smart phones. Due to these capabilities, a number of individuals as well as organizations are subscribing for this service from the various vendors existing in this area. These cloud providers differ from their services in a great deal. This work compares the offering of different storage provider considering the storage space, synchronization capabilities, pricing, compliances etc. Finally, we discussed the major issues that exist in cloud and methods to address them without compromising the cloud performance.

Keywords— Cloud storage, Cloud issues, Cloud performance, storage security.

1 INTRODUCTION

Cloud computing has emerged as utility based model [1]. In cloud computing, the powerful computing capabilities have been shifted from user end to the cloud provider's end. Users can access IT resources from anywhere and at any time, using multiple devices, such as Smart phones, tablets, laptops, etc. [2]. Users can access the cloud resources with the help of browser or installing small application at the client end [3].

Cloud computing offers a wide variety of services, which can be broadly categorized into Infrastructure as a Service, Platform as a Service and Software as a Service. When users are utilizing the powerful computing resources such as processor, memory, storage, etc. then it is known as Infrastructure as a Service (IaaS) [5-7]. When applications are offered through the internet at that time, it is known as Software as a Service (SaaS) [3-5]. Whereas,

platform offered to develop an application is known as Platform as a Service (PaaS) [8].

Cloud services are capable of offering traditional IT services with significant cost advantages [9-10]. In IaaS model, responsibility of procuring and maintaining the resources lies on the cloud provider; users end has limited resources capabilities so that it can get connected to the cloud resources. However, services offered in IaaS are charged as per the resources subscribed (powerful processor, more memory, etc.) and their usages. IaaS have significant importance, since hardware gets outdated in every three years as per the Murphy's Law. Therefore, IaaS is profoundly appealing to Small and Medium Enterprises (SMEs), due to the fact that infrastructure is to be updated by the cloud provider; therefore it frees SMEs from potential

updating of hardware while users enjoy the ubiquitous and wide network access.

Beyond traditional desktop, handheld devices such as tablets as well as Smart phones can also be used for accessing the resources and processing of the data. However, these devices suffer from limited storage capabilities. To address this issue, cloud providers are also offering cloud storage services that are appearing to offer unlimited storage capabilities. Amazon, Google, Microsoft, etc. are some of the major cloud providers offering storage as a service with different nomenclature. Recently, a new trend of storage has emerged in which cloud can be used for storing and backup of the data, similar to that of flash drive and external hard disk, known as storage drive. Drop Box, Google drive, Microsoft's sky drive, etc. are some of the prominent examples of such services. Cloud drive is also much sought due to its impression of infinite resources for the clients, to host data backup. It substantially reduces the storage expenditure of government and enterprises which need to store petabytes of data [11].

Cloud storage opening the doors for variety of threats such security, availability of resources and latency is the prominent issues that need to be addressed in cloud storage. Same has been discussed in section V.

2 RELATED WORK

To address the security and performance many of the useful work is already available in various prominent journal of this area. Some of these prominent work related to the above subject has been discussed as follows:

To continue using security without compromising security of the data in cloud. [12] Suggested the method that return only those file that may be related to the user only not all the files. This methods was immensely helped to improve the performance without compromising security. [13] Have designed their own cloud to improve the performance of cloud storage application related to the data mining. In other work to address the security issue [14] have proposed a method capable of securing the cloud and also supports dynamic users and data provenance.

To understand the internal cloud architecture [15] have conducted a study to understand the cloud performance based on architecture and compared the 05 major cloud offers, to assess their performance based on benchmark. [16] Have measured the performance of drop box- a personal cloud storage-from various places to identify the architectural and storage protocol dependency of cloud.

[17- 20, 29] have discussed about the cloud security due to remote storage of the data and advocated for the public auditability of cloud storage.

3 POPULAR CLOUD STORAGE

Considering the huge growth potential in cloud storage, a number of cloud providers are offering data storage and backup services. To attract the enterprises and individual users, cloud providers are also offering some of the storage free of cost. Some cloud providers are entirely dedicated for mobile devices, for instance iCloud. Therefore, it is imperative to understand the salient features of the prominent cloud drive existing. In order to facilitate the users, it also compares the cloud storage offered.

A. Google Drive

Google drive is the Google version of storage drive and one of the most popular services of this segment. Its integrity with the Gmail provides further popularity and usage. It has the following main features:

- Supports Photos, Videos, documents and other files.
- Initially offers 15GB free.
- More than 30 file type can be viewed without installing the software on user's computer.
- Facilitates the sharing of Google document.

B. Drop box

Dropbox is the leader in cloud drive and having major share in this segment. Dropbox itself uses public cloud model of Amazon. Some of the salient features of Dropbox are as follows:

- Divides it offering into 03 categories i.e. free, Pro-account and business account.

- Initially offers 2 GB free that can be extended upto 18 GB by utilizing various services, for instance, referral programs.
- Supports windows, Mac, Linux, iPad, iPhone, Android & Blackberry.
- Keeps one month history of user's work. Therefore, any changes can be undone and file can be undeleted.
- Provides admin console to view member activities, various linked devices and apps used to access the resources.
- Dropbox provides the security during transmission and storage of the data. During transmission it uses SSL, while for storage AES-256 is used.

Reliability is the major concern of the cloud user. Dropbox claims to offer 99.999999999 % durability and 99.99% availability of objects over a given year through Amazon public cloud.

Certification and compliances: Dropbox storage provides the following compliances and certification, SSAE16/SOC1 SOC2, ISAE 3402 and ISO 22001 certified on Amazon S3. Dropbox complies with US-EU and US Swiss safe harbor frameworks regarding personal data [ref].

C. iCloud

iCloud is cloud storage and computing services launched in Oct 2011 [ref]. In March 2013, Apple implemented 2-way authentication to enhance the user's security. However, a huge security hole is detected that any hacker can reset the user's password by knowing his email-id and date of birth. The two ways authentication also faced the criticism due to delay took place at the provider's end in switching over. Users who have given consent to switch over; provider took 02 days in making the new service available [21].

iCloud can be accessed using iPhone, iPad, or iPod with iOS 5 or later. It supports AES 128 or more key for security during transmission, storage in server.

Recently, iCloud has released interesting number related to iCloud usage. As per the Apple, 300 million accounts, 800 billion messages and 7.4 trillion push notification are served by iCloud since its inception [22].

D. SkyDrive

IT Giant Microsoft offers its storage drive with the name, Skydrive. It offers the following functionalities:

- Allows access of file from wide range of devices, such as PC, Mac, phone and tablets.
- Skydrive offers an application named 'Skydrive desktop app' that can be installed on desktop. By using this application, users can be benefitted of automating the update process between desktop files and Skydrive. Any folder added to this app will be automatically updated to Skydrive locations.
- Allows sharing of file by means of e-mail, face book, with a link but the maximum size permitted for this process is 2 GB.

4 CLOUD COMPARISON

Prominent cloud storage differs with one other to a great extent. These differences can be attributed to various factors, including free space, file type support, sharing support, etc. Comparative features of these services have been illustrated in the following table.

Table 1: Comparing the Cloud drive

	Google Drive	Dropbox	iCloud	OneDrive
Free Space	15GB [23]	2GB [24]	05 GB [25]	07 GB [26]
Sync Support	Yes	Yes	Not available	Yes
Sharing support	Yes	Yes	Yes	Yes
Office package support	Yes	No	No	Yes
Types of account offered	Free	Free	Free	Free
Encryption Support	NA	AES-256	128, 256 AES	NA

Reliability		99.9999 999999		
Compliance	FISMA, ISO- 27001, SSAE 16, HIPAA	SSAE 16 SOC audits, SOC 2 type 2[27]	NA	ISO2 7001, FISM A, HIPA A BAA
2-way authenticati on	Yes	Yes	Sup porte d[i1]	Yes
OS Support	Window, Mac, Android, iOS,	Window, Mac, Android, iOS, Linux, Kindly fire, BlackBer ry	iOS, Mac, Wind ows 7 or 8,	Wind ow, Mac, Andro id, iOS,

followed by corporate sector. Results also revealed that there is more threat on corporate data, the key reason for this is to take the competitive edge on the competitors.

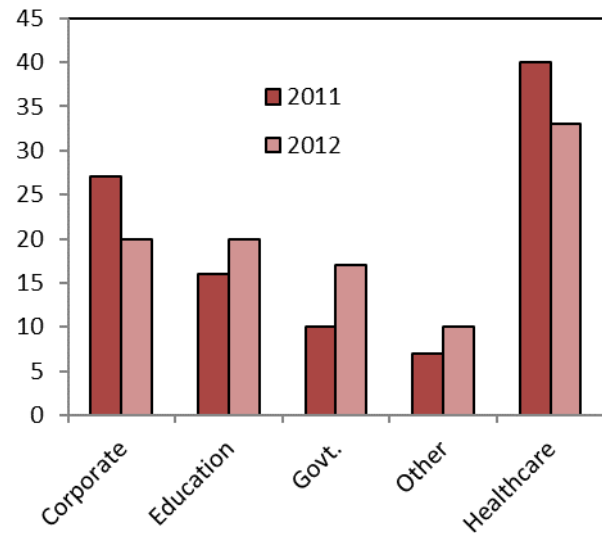


Figure 1: Security breach 2011(Q4) and 2012(Q1)

5.1.1 Transmission security

A. In cloud ERP, data is required to be transmitted from user end to the cloud provider's end. Users are accessing the cloud resources using computer or more frequently using portable devices due to mobility. Transmission requires security so that no one in between can infer the transmitted data. To secure the transmitted data, encryption can be used, but existing encryption techniques that includes RSA, Data encryption standard (DES) and triple DES, degrade the performance.

B. Cloud solution: In cloud computing resources can be accessed by browser that supports SSL for security that encapsulates application specific protocols HTTP or HTTPS. Data encrypted by SSL is difficult to infer, at the same time having negligible overhead on performance. SSL is highly suitable for financial institutions such as Banking, healthcare, and share trading etc.

5.1.2 Storage Security

In traditional system user can access the resources by supplying the credential. This mechanism ensures that only legitimate users get the accessibility of the resources. Security is

5 ISSUES IN CLOUD STORAGE

Cloud storage is widely used by the various enterprises and the individual users. It is appreciated due to its wide, anytime and anywhere accessibility. However, a number of issues are prevailing in cloud storage and need immediate attention. Major issues that are applicable for the cloud storage are:

- Security Issue
- Performance

5.1 Security Issue

In recent years, information & data security breach has become the vibrant subject. In 2012, [28] released a report related to information security and data breach. Report has identified 60 sectors where the data breach has occurred. It also compared the information and data breach for the various sectors, including, corporate, education, healthcare, etc. that took place in 2011 and 2012; same is illustrated in figure 1[28]. From the result of figure 1, it is revealed that health care is the most sensitive industry for data security and highest number of data breach has occurred in this industry. It is

compromised due to the personnel having physical accessibility and they misuse that privilege. To overcome this limitation, application ensures that data at storage is encrypted and anyone accessing the stored data gets the encrypted copy only. This data can only be de-encrypted by the application logic of user's application.

Cloud solution

In case of cloud, it is the responsibility of the cloud provider to ensure that data is secured. Therefore, provider has to place the measures so that there is no direct snooping of client's data.

5.1.3 Physical security

A. Critical and sensitive data is stored in enterprise premises, and location of physical storage is known. To secure the data physically requires heavy guarding, which leads to huge expenditure. Even with the high expenditure incurred security is compromised due to security personnel employed may be tempted to get the data. In case of cloud, location of data is not known, size of data center is extremely large therefore locating the data of a particular company from thousands of storage devices is challenging.

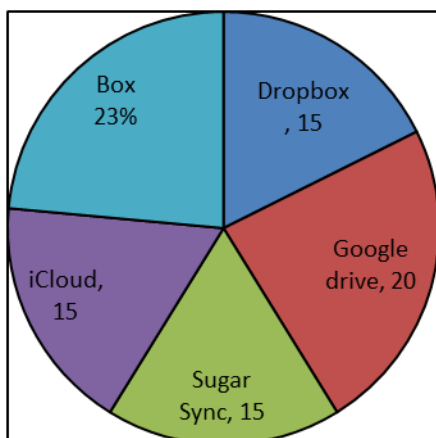


Figure 2: Share of Personal Cloud Storage

B. Solution

Improving security in cloud storage is critical issue and provider need to follow the certain measures to ensure that data stored in the cloud is safe and secure. At the same time cloud users also need to ensure that the cloud storage which they have subscribed is secure and fulfilling the major security standards prescribed by the various agencies. The upcoming section describes the major standards in

the cloud storage to be followed and measures that need to be put in place to ensure the cloud storage security.

1. In Google drive, cloud lock can be used, this improves the security of personal information and ensures PCI compliance. It assists the users in locating the file and documents containing sensitive personal and financial information.

5.1.4 Compliances

Due to multi-locations of cloud data center, even though cloud providers say they provide the identical control in all data center, yet the user is concerned whether it exist in paper or in reality, therefore warrant on site audits.

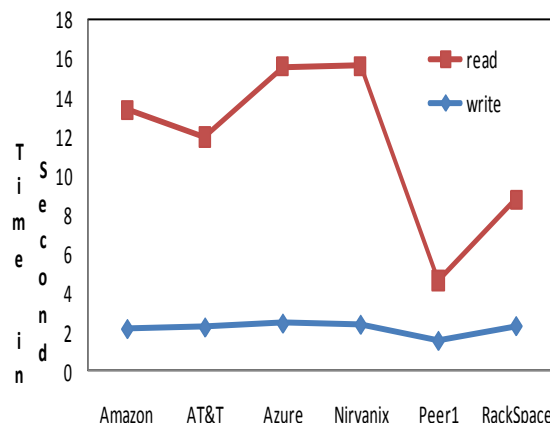


Figure 3: Average read and write time

Commercial environment need to comply with Center for internet security (CIS) or by and industry group such as the payment card industry (PCI) security standards council (SCC).

Use of VMware's Vcenter configuration management (VCM) support shows sync/ deviation from the compliance such as SOX, PCI, DSS, HIPAA & FISMA An emerging standard called the NIST security control automation protocol(SCAP) also supported by VCM.

5.2 Performance Issue

Performance in the cloud is a critical issue and considered as detrimental factor for proliferation of cloud. Users subscribing for the cloud presumes unexpected computational power and expects the performance at-least similar or more than the desktop. Therefore, clouds which will not be performing as per the expectation of the cloud user will vanish from the scene.

To evaluate the cloud based on performance, a study is conducted by Nasuni [12]. As per this study a number of cloud provider have considered for the study to determine which cloud is performing the best. As per the study, many cloud could not pass the minimum benchmark set for the performance [Rel1]. However, the cloud provider like Amazon, AT&T, Azure, Nirvanix, etc. were the outperformers among the considered cloud. [12] have studied the performance for substantially long time from 2009 to 2011. Performance was measured on the basis of read and write speed of the cloud considered. The other factor was availability and reliability offered by the cloud provider. Same has been discussed in the upcoming sub-section.

5.2.1 Read and Write speed

To determine the speed of cloud provider read and write speed was measured of various cloud considered. If the cloud provider is having better speed of reading and writing then it denotes the less time taken to perform certain task. Read speed was extremely good of Nirvanix and closed followed by Azure, same is illustrated in the figure 3. Correspondingly, the write time taken by the other cloud provider was also evaluated, it is revealed that

Nirvanix, Azure, Rackspace is having the better speed than other cloud providers, refer figure 3. In both the occasion peer1 was having the minimum speed for reading and writing. Therefore, it will be appealing to the segment of user who prefer the cloud speed that should be excellent among it segment.

5.2.2 Reliability and availability

Reliability is a major issue in cloud computing due to the resource controlling by the cloud provider. Therefore, users expect high level of services for the

subscribed cloud. Data that is stored in the cloud provider's end must be secured. At the same time it is only inevitable that cloud should services must be available for the maximum of the time. However, that is not the case. Almost, all the cloud considered, almost all the cloud are having downtime. In the measured case, Azure, Rackspace were the two cloud providers who have substantially suffered from the cloud outage. However, Azure and Rackspace cloud provider were the victorious for the availability. They have outperformed the other types of cloud provider of this segment.

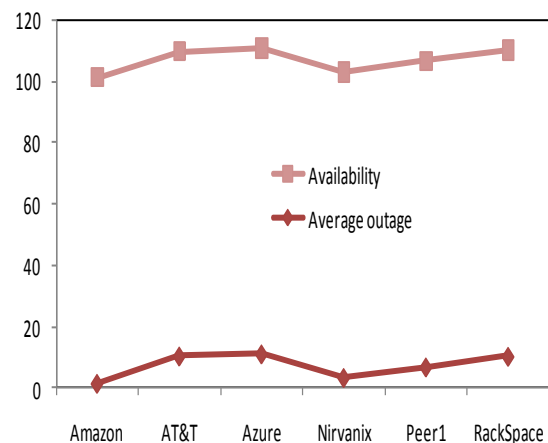


Figure 4: Average Availability and cloud outage

6 CONCLUSION

Cloud storage has the huge potential to emerge as the substitute for legacy storage. It equally appeals to individuals as well as SME. A number of predictions are in the favour of cloud storage and cloud drive. However, before subscribing to the cloud storage great care is to be observed related to security and performance to avoid any loss later on. It will be equally important that cloud provider should not only keep the cost to the affordability of the cloud users instead also take care of security and performance issue so that those who have adopted the cloud are more satisfied. This will facilitate the exponential growth of cloud computing.

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