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Cloud Storage: Merits and Demerits for Small-Scale Business

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ABSTRACT

This paper presents a complete overview of the storage landscape and cloud computing. It explains the major advantages and disadvantages of storing data online using cloud storage, how this works, and the basic concepts involved in cloud computing, while also demonstrating the layers of its architecture with reference to the Infrastructure as a Service (IaaS) that contains the cloud storage architecture. The paper further discusses the concept of Storage as a Service (StaaS), which lets users or clients utilize cloud storage to save data by providing them space without them having to use physical storage.

Keywords :Cloud Storage, Cloud Computing, IaaS, PaaS, iPaaS, SaaS.

I. INTRODUCTION

In Internet-based computing, cloud storage is a trend that utilizes a shared computing system involving numerous computers that work on a specific network to accomplish a particular task on demand. Moreover, cloud storage is used to store end-users' data within the cloud without using a local system; through network connectivity, this data can be accessed anywhere and client services can be provided.

Despite the powerful advantages presented by the services of cloud computing, some security problems have been raised for organizations and private users, as these services depend on data distribution, connectivity, and access to the network. For the purpose of understanding more about the insecurity, dangers, and associated issues with cloud storage and the services of computing providers, it is necessary to review the techniques by which these services are organized and represented [1].

One issue is that of how diverse clients can share a physical facilitating condition so that it can be utilized upon request with compensation for every utilization-evaluating model.

To solve this issue, it is possible to utilize the service model of Infrastructure as a Service (IaaS), which involves offering physical and virtual equipment (for example, servers, stockpiling and systems administration frameworks) that can be provisioned and decommissioned rapidly through a self- service interface. On these IT assets, clients introduce their individual operating systems (OSs), middleware, and applications programming supporting their businesses [2].

Cloud service models contain three service layers: Platform as a Service (PaaS), Infrastructure as a Services (IaaS), and Software as a Service (SaaS). The layer that involves cloud storage is Infrastructure as a Service (IaaS), which incorporates the virtual and physical resources used to build the cloud [1].

Cloud storage services take the form of three major models:

- Public cloud storageservice;
- Private cloud storageservice;
- The hybrid service model, which is a mix between the above two models[3].

II. CLOUD STORAGE AND ITS ARCHTECTURE

Cloud storage allows users, customers and companies to store their information and data within the cloud without using local systems. These data and information can be accessed perfectly via client services and network connectivity. One of the essential advantages of cloud storage is that clients such as users, customers, and companies can obtain and access their data from different device locations. Cloud storage has a number of features, such as availability (data are always available from different devices, such as PCs and mobile phones), durability (data are safeguarded from crashes), and performance (data can be accessed in a timely fashion) [4].

There are numerous different systems of cloud storage, some of which have a quite specific focus (e.g. storing electronic mail or digital images on the web), while other types have the ability to handle several types of digital information. Some cloud storage systems are small operations, while others are large enough that the real material fills up an entire warehouse. Data centers are systems of facilities used to house cloud storage. These use only one server, which is connected to the internet; users can send their information and data of any format to the server over the internet, and the data server receives the user data and keeps it. Any time the user wants to retrieve that data, it can be accessed from the server via a web- based interface. The data server then either permits the user to use and handle the data on the data server itself or returns the files to the user [3].

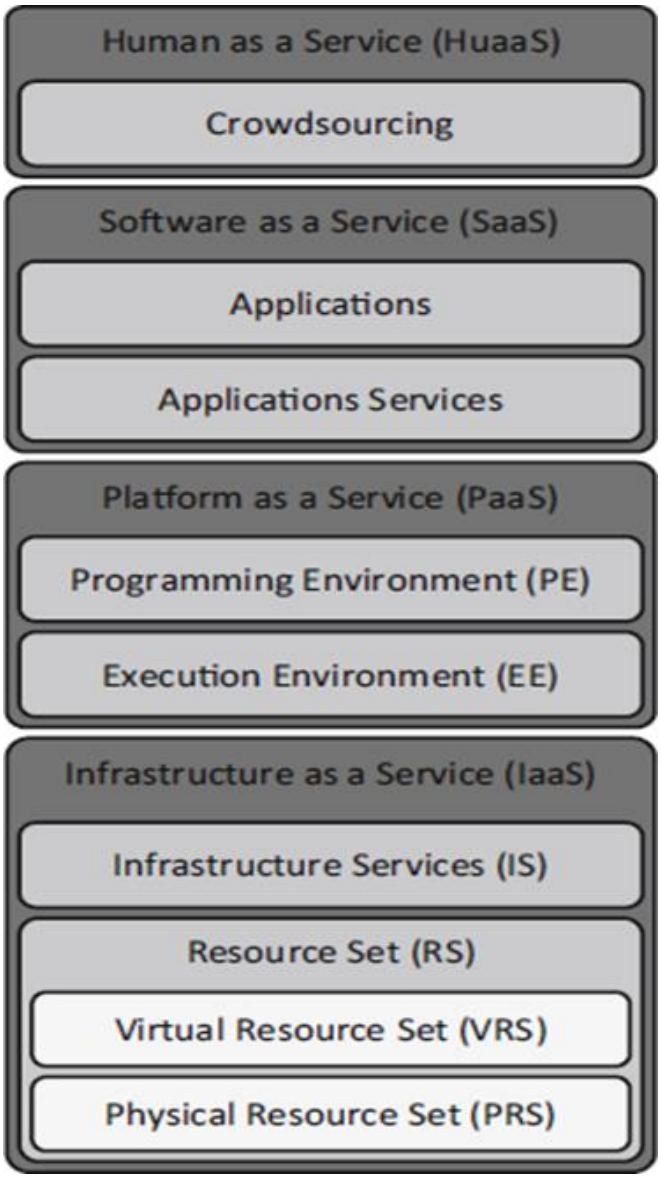

Fig. 1. The Stack of Cloud Architecture [6]

Storage as a Service (StaaS) assists cloud applications to be scaled beyond their restricted service. Users with StaaS can save their information and data anywhere and at any time, as well as easily access their resources. Users' information and data are made available at any time in a high-performance and reliable manner [3].

There are three types of cloud service models: first, Software as a Service (SaaS), e.g. Gmail, in which the software supplied is utilized by users; second, Platform as a Service (PaaS), in which applications are implemented in the cloud administration by client customization; third, Infrastructure as a

Service (IaaS), in which skillful users execute their programs to best utilize the available computing ability. We will concisely cover these models in more detail below [7].

A. Software as a Service

Software as a Service (SaaS) offers data and application services. The service provider offers the entire infrastructure and platforms required, and furthermore supplies applications and data. SaaS is the initial model of cloud service; it is the consummate and most famous model, representing the most numerous provider choices by far [8].

SaaS offers a perfect application for containing complicated programs; for instance, those used in client relation administration (CRD) or for undertaking resourceadministration through the internet [7]. SaaS lets users save their information and data at a distance.

When software programs are stored off-site, the client does not have to maintain or sustain them. In other words, it is outside of the client's hand if the hosting service decides to modify it. Fig. 2 explains SaaS in the stack of applications [9].

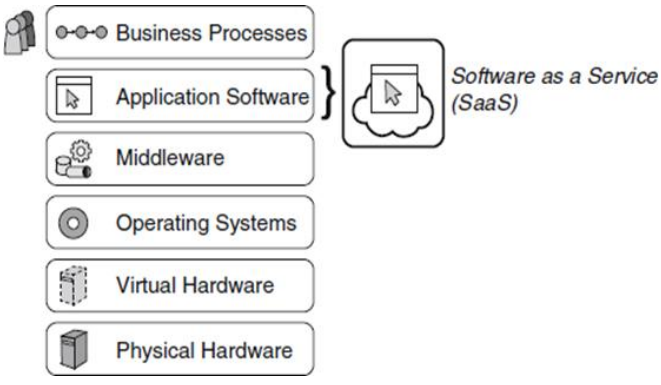

Fig. 2. SaaS in the Stack of Applications [2]

B. Platform as a Service

PaaS provides application improvement environments to clients. As a rule, PaaS provides and evolves toolkits and models for application improvement, as well as forms for administration and payment service. PaaS delivers packages commonly including an operating system, implementation location for programming languages, web servers, and databases. The clients of PaaS providers can easily improve and execute their software systems on the compressed cloud service without complications, and can also learn about the complexity of administrating layers of software and hardware. Furthermore, the time required is reduced because the clients do not have to purchase this fundamental infrastructure. It is typical for the PaaS to supply solutions providing mechanical scaling of the storage resources to the corresponding demands of the application. In addition, the user of the cloud does not need to manually assign resources; clients can create, implement and manage integration streams using iPaaS (Integration Platform as a Service). Fig. 3 explains PaaS in the stack of applications [1].

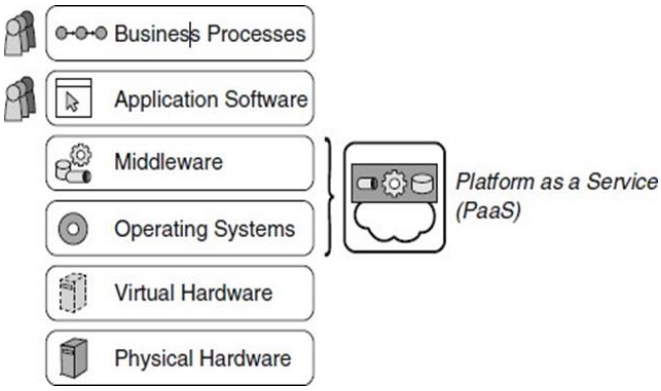

Fig. 3. PaaS in the Stack of Applications [2]

C. Infrastructure as a Service

Infrastructure as a Service (IaaS) is the third service offered by cloud vendors and involves providing storage and calculation resources that can be used by developers and IT organizations to provide customized business solutions. A cloud supplier would aim to design its IaaS provisioning capability as a modular service with published interfaces, allowing it to be used in many different

environments. Fig. 4 explains PaaS in the stack of applications [10].

IaaS points to online administration solutions that are unique to the client in terms of the subtleties of the basic infrastructure: for example, security systems, physical area, stack adjusting, physical processing assets, information segmenting, reinforcement, and recuperation bolstering, among others. While the customer does not oversee or control the hidden cloud infrastructure, they have control over storage and operating systems, as well as limited authority over resources [1].

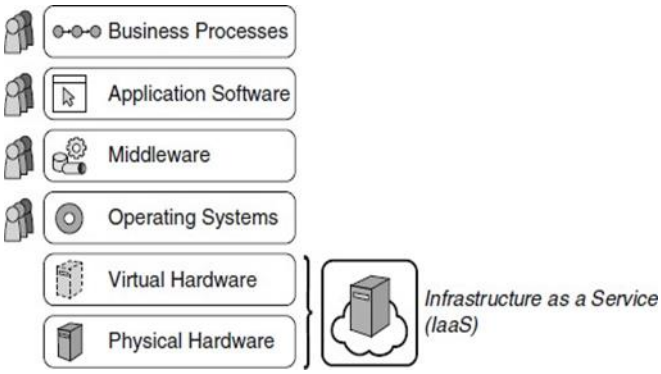

Fig. 4. IaaS in the Stack of Application [2]

Infrastructure clouds (IaaS) can essentially be assembled in two ways: infrastructures of service or centers of the cloud. Both permit the majority of the abilities one anticipates from IaaS:

- Scale on interest;
- Pay-as-you-go;
- Conversion of capital consumptions to operational uses;
- Programmatic API (Application Programming Interface) and GUI (Graphical User Interface);
- Basic framework: stockpiling, servers, system, power, and network [11].

The properties of cloud computing are empowered in an IaaS (Infrastructure as a Service) cloud as follows:

- Access through the network: Remote access to specific servers and network capacity. Plates are one of the key highlights of IaaS. Commonly, when first setting up a virtual server, it can be accessed remotely through a safe shell (SSH) or graphically (e.g. by utilizing the remote desktop protocol that is contingent upon both the OS running on the server and its design). Clients commonly get full access to the servers.

- On-request self-service: Clients can regularly access IaaS contributions by means of a Web portal that enables clients to design and arrange servers, as well as the stockpiling and availability of the network. One essential part of such an on-request self-service entry is the observation, which permits overseeing the status of the resources of provisioned IT, their setup and the comparing charges. This data can likewise regularly be removed from the cloud supplier in a mechanized manner utilizing an API.
- Pay-per-use: Models of pricing for IaaS are frequently based on an hourly charge for servers; the amount of information stored every month, and the amount of information traded by means of the cloud supplier's network every month. Costs for servers range from a couple of pennies each hour for small servers to varying amounts of dollars every hour for bigger and potentially bunched servers. To facilitate the figuring and examination with customary servers preparing a control, unpredictable disk storage and memory costs are usually decided as indicated by a specific arrangement of server designs that take after conventional servers. Generally speaking, these server arrangements are available in different sizes (for example, S, M, L, XL, XXL and so on).
- Pooling of resources: IaaS cloud resources are shared between clients on the hardware infrastructure level. Consequently, the IT resources pooled between various clients of an

IaaS cloud typically include the servers, data center, and those network components that are entirely physical (for example, the switch, router, links and firewalls, as well as the staff who maintain and manage the data centers).

- Rapid elasticity: The adaptable utilization of servers is a key element of IaaS clouds, resulting in their prosperity and essentially separating them from other server- facilitating contributions. In a run-of-the-mill IaaS offering, new servers are set up in minutes, while disk storage and firewalls are provisioned right away. Essentially, all resources charged for can be arranged to maintain a strategic distance from further charges in only a few minutes. This fast flexibility on the foundation level facilitates including or dispensing with infrastructure resources upon request [2].

III. SECURITY OF STORAGE

The safety of storage includes physical security of storage media and security of information. Cloud storage security, as a general network form of storage, involves authority, certification, auditing, encryption etc. Automatic redundant replications make recovery easy once a failure occurs. The security of cloud storage can also extend to the entire storage service process, involving software, hardware, data, security of the network and private security for clients, etc. Cloud storage tends to merge with cloud security that is more robust [12]. A number of different cloud storage providers are presented and the security properties for these providers are compared in the table 1.

Users are required to input two pieces of information (at the two-factor level) for login purposes: for instance, their password and a (one-time) passcode sent to the client.

EV (Extended Validation) Certificates include an additional security level to ensure that nobody intercepts your information while it is in motion between you and your cloud storage system.

TABLE I.SECURITY AND PRIVACY FEATURES

Provider	Two-factor	EV for HTTPS	Encryp-tion	Zero Know-ledge	Compliance
Google Drive	yes	useless	no	no	Safe Harbor
OneDrive	yes	yes	no	no	
Amazon Cloud Drive	no	no	no	no	Safe Harbor
Copy	no	no	AES-256	no	Safe Harbor
Box	yes	no	AES-256	no	Safe Harbor, APEC
Dropbox	yes	useless	no	no	Safe Harbor
iCloud	yes	yes	AES-128 min	no	
Mega	no	no	AES-128	yes	Safe Harbor
Tresorit	yes	yes	AES-256	yes	Safe Harbor

There are a number of algorithms used for data encryption. The field of encryption offers the NIST-suggested AES-256. On the other hand, zero-knowledge encryption refers to cases when the cloud storage provider cannot decrypt the user's information. The data encryption process happens on the user's end, after which it is sent it to the provider via a secure connection.

Compliance demonstrates a commitment to the privacy and security of data. There are many standards for data confidentiality and security, such as 'Safe Harbor', which means that the cloud storage provider meets the information security and privacy needs of the EU's information protection regulations [13].

IV. ADVANTAGES OF CLOUD STORAGE

There are a number of key advantages of utilizing cloud storage and uses that take the preferred standpoint of capacity in the cloud.

- ✓ Simplicity of administration: The support of the programming, general infrastructure, and hardware used to buttress stockpiling is definitely improved by an application in the cloud. Applications that take the favorable cloud-based form are generally far less demanding to set up and maintain than a proportionate level of administration installed on the premises. Frequently, on the client's side, all that is required todeal with your capacity execution is a straightforward web browser, leaving the complexities of management to the service provider.
- ✓ Cost-effectiveness: Cloud storage is useful for mitigating ownership fees. Removing costly systems and the requirement for the client to maintain them normally gives organizations noteworthy cost reserves that more than counterbalance the charges for cloud storage. The fees associated with having the capacity to obtain elevated amounts of accessibility and the adaptability an organization requires are moreover unmatched in terms of savings. In essence, the economies of scale accomplished by server farms basically cannot be coordinated by anything except the largest of organizations [14].
- ✓ The methodology of storing information in remote cloud servers is known as cloud storage. Storing on the cloud is far better than other conventional storage strategies. A portion of the explanation behind that is:
- ✓ Companies do not have to establish physical storage devices at their own server farm or workplace;
- ✓ Maintenance tasks involved with storage, including the backup and purchase of additional storage devices, are taken out of a service provider's responsibility, permitting the organization to focus on its core business;
- ✓ Companies only have to pay for the storage they use [15];
- ✓ Lower impact failures and upgrades: Cloud computing typically delivers cost-effective storage hardware redundancies. This results in uninterrupted service during a scheduled or unplanned breakdown. This also applies to hardware upgrades, which will no longer be visible to the client;
- ✓ Simplified layout: Cloud storage solutions free up the capacity for the IT director of Detailed Planning. Flexible cloud-based storage solutions are provided as required, eliminating the need for more storage that can be required to accommodate them [14];
- ✓ Center competency: By utilizing public clouds, the client is basically redistributing its centers of data and administration of infrastructure to organizations whose central competency is administrating infrastructure. Consequently, the client invests less time administrating infrastructure, freeing up additional time to concentrate on its own core competencies;
- ✓ Utility estimating: The client pays only for the resources it consumes. This enables the end client to add more cloud services when it needs to scale up. The client no longer needs to secure physical equipment in this model, and accordingly is afforded a tremendous opportunity to dispense with squandered figure cycles by expending only what is required, when it is required;
- ✓ Elasticity: The client has an apparently unending pool of resources at its disposal and can design its softwaresolutions to powerfully increment or decrease the measures of calculating the resources it needs to handle peak burdens. This enables the client to respond in real time to unusual spikes in traffic, while under a specific on-premises cloud or non-cloud arrangement, the client would need to officially secure or rent the important resources required in order to deal with usage peaks [16].

V. DISADVANTAGES OF CLOUD STORAGE

In addition to the benefits, there are also a number of disadvantages and risks associated with utilizing cloud storage. Some of these disadvantages are shown below:

- ✓ Leaks and data access without permission between virtual devices operating on the same server;
- ✓ Errors on the part of a cloud supplier in handling the correct management and saving of sensitive data;
- ✓ Sometimes the cloud service may be unavailable for extended periods of time due to errors and system crashes;
- ✓ Hackers may break and enter into a client's applications hosted on the cloud, and thus access and distribute sensitive data [17];
- ✓ Reliability issues;
- ✓ Possible inability to maintain the integrity of data (making sure the saved information is "correct") [14];
- ✓ Limited setups: Vendors of public cloud solutions have a standard arrangement of foundation setups that meet the necessities of the overall population. In some cases, exceptionally specialized hardware is required to deal with escalated computational issues. In cases like this, use of public cloud solutions is often impossible, on the grounds that the required functionality is simple not offered by the vendor [16].

The below figure presents some issues of concern for clients regarding cloud storage services, such as control, security, support, performance, and vendor lock-in.

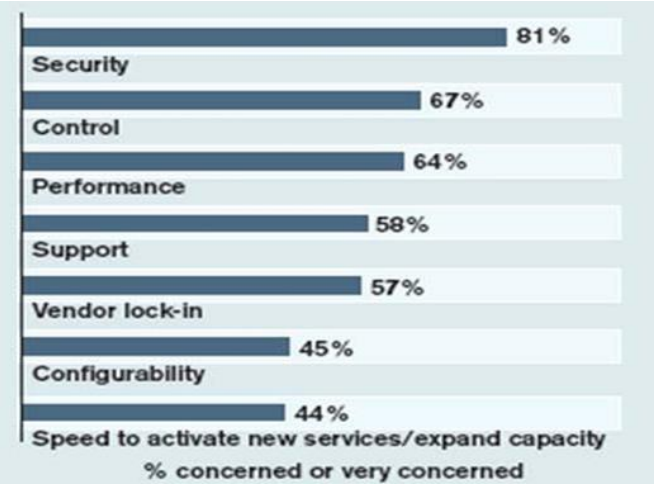

Fig. 5. Concerns expressed by users [14]

VI. CONCLUSION

We are living today in what is known as the information century. Thus, saving and protecting the information created by users is vital; different companies need to save and protect this information in an easy way such that it is always available to users. By using cloud storage, clients, customers, and organizations will become able to protect and save their information within the cloud without having any physical devices or local systems. For the purpose of understanding the cloud storage and how it works, we described the layers that define cloud computing architecture. In particular, the layer of Infrastructure as a Service (IaaS) includes cloud storage, along with the virtual and physical resources used to build the cloud.

This paper presents detailed information about cloud storage and cloud computing. It covers a different number of cloud storage providers and compares these providers to each other. Subsequently, it also discusses the key advantages and disadvantage of cloud storage and demonstrates some of the associated challenges.

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